Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

FILE COPY

UNITED STATES
DEPARTMENT OF AGRICULTURE
LIBRARY



Reserve
BOOK NUMBER
A464.07
P693B
1934
967060

5
Part I
56438

B L I S T E R R U S T W O R K

I N T H E F A R W E S T

January 1 to December 31, 1934.

LIBRARY
RECEIVED
SEP 26 1960
U. S. DEPT. OF AGRICULTURE

Blister Rust Control
Division of Plant Disease Control
618 Realty Building
Spokane, Washington



Mature Sugar Pine - Yellow Pine type, near Dorrington, California, on the Stanislaus National Forest. Such areas represent a low protection cost because they contain few Ribes and can be worked easily and rapidly.

CONTENTS

	Page
Introduction	1-5
Blister Rust Control Work in Montana	6-16
Memorandum of Understanding	7
Ribes Eradication, Cabinet Project	8-16
Scouting for White Pine Blister Rust in the Inland Empire	299-302
Blister Rust Control Work in Idaho	17-114
Memorandum of Understanding	17-18
Ribes Ecology in the Inland Empire	19-27
Effects of Cutting Methods on Ribes Seed Germination and Seedling Survival	19-26
Influence of Various Types of Management on Ribes Seed Germination and Seedling Survival	26-27
Ribes Eradication, Inland Empire	28-38
Chemical Eradication Methods	39-52
Plot Studies Testing the Effectiveness of Atlacide, Ammonium Thiocyanate and Mixtures of Atlacide and Zinc Chloride Solutions When Applied to the Aerial Portions of Ribes Bushes and to the Soil	42-45
Plot Studies Testing the Effectiveness of Light Single Treatments with Atlacide and Ammonium Thiocyanate Solutions	45-47
Studies Testing the Effectiveness of Late Season Ground Applications of Atlacide and Ammonium Thiocyanate Solutions to Individual Ribes Bushes	47-49
Studies Testing the Effectiveness of Spraying and Hand Pulling Methods for Mop-up Work on R. inerme Areas	49-51
Special Experiment Treating an R. inerme Area with an Ammonium Thiocyanate Solution to Prepare the Area for Burning Ribes and Brush in Place	51-52
Ribes Eradication by Bulldozer Method	53-61
Ribes Eradication, Clearwater Project	62-73
Ribes Eradication, St. Joe Project	74-89
Ribes Eradication, Coeur d'Alene Project	90-101
Ribes Eradication, Kaniksu Project	102-114
Scouting for White Pine Blister Rust in the Inland Empire	299-302
Blister Rust Control Work in Washington	115-117
Ribes Eradication, Mount Rainier National Park	116-117
Scouting for White Pine Blister Rust in the Inland Empire	299-302

Page

Introduction..... 1-2

Blister Rust Control Work in Idaho..... 17-114
Ribes Ecology in the Inland Empire..... 18-
Effects of Cutting Methods on Ribes Seed Germination
and Seedling Survival..... 18-45
Influence of Various Types of Management on Ribes
Seed Germination and Seedling Survival..... 46-
Ribes Eradication, Control Methods..... 56-
Chemical Eradication Methods..... 56-80
Plot Studies Testing the Effectiveness of Various
Amounts Poisonous Salt Mixtures of Effective and
Blue Chlorotic Solutions Used Applied to the Basal
Portions of Ribes Bushes and to the Soil..... 1-43
Plot Studies Testing the Effectiveness of Ammo
Simple Preparation with Ammonium Thiocyanate
Chlorophenate Solutions..... 43-47
Results Testing the Effectiveness of Basic Ammo Chemical
Applications of Allaseide and Ammonium Thiocyanate
Solutions to Individual Ribes Bushes..... 47-49
Studies Testing the Effectiveness of Spraying and
Hand Pulling Methods for Eradication of Ribes
Area..... 7-61
Experimental Dusting on Ribes Bushes as
Ammonium Thiocyanate Solution to Prepare the Area
for Planting Ribes and Trees in Plots..... 81-82
Ribes Eradication by Foliage Sprays..... 82-
Ribes Eradication, Chemical Preparations..... 82-
Plots Established, Ribes Eradication Project..... 7-
Ribes Eradication, Power Dusting Project..... 7-
Ribes Eradication, Hand Pulling Project..... 110-114
Ribes Eradication, Results Obtained..... 114-116
Reseeding for White Pine Blister Rust in the Inland Empire.. 116-202

Silvics and Control Work in Washington..... 115-117
Ribes Eradication, Recent Tuning Tests..... 115-117
Scouting for White Pine Blister Rust in the Inland Empire..

	Page
Blister Rust Control Work in Oregon	118-136
Memorandum of Understanding	118
Blister Rust Control Activities in Oregon During 1934	119-136
Ribes Eradication Projects	119-134
Control Reconnaissance	135-136
Scouting for Blister Rust in California and Oregon	181-187
Blister Rust Control Work in California	137-188
Memorandum of Understanding	137
Ribes Ecology	138-146
Ribes Reestablishment in Stream Type after Logging	138-141
Ribes Reestablishment after Eradication on Cut Over Land	141
Ribes Growth and Germination	141-142
Ribes Seed Germination and Seedling Survival	142-143
Ribes Seed Storage in the Duff and Soil	143-144
Crown and Root Studies of Ribes Bushes	144
Dissemination of Ribes Seeds	144-145
Miscellaneous Studies	145
Summary	145-146
Ribes Eradication	147-171
Control Reconnaissance	172-180
Scouting for Blister Rust in California and Oregon	181-187
Educational Work	188
Blister Rust Control Work in Colorado and Wyoming	189-213
Memorandums of Understanding	190-193
White Pine-Ribes Survey	194-213
Progress in Chemical Investigations	214-251
Results of 1933 Field Work	214-226
Laboratory and Greenhouse Work, September, 1933 to June, 1934	226-227
Field Experiments of 1934	227-242
Gross Morphology of Stem and Root Systems of California Ribes	242-249
Recommendations for the Use of Chemicals in Ribes Eradication	250
Outline of Laboratory Work for the Winter of 1934-1935	250-251
Progress Report of Studies in Effectiveness of Control	252-298
The Growth and Regeneration of Ribes in Stream Type Following Ribes Eradication	254-260
The Effect of Known Amounts of Ribes Per Acre in Spreading and Intensifying Blister Rust	261-263

Page

Blister Rust Control Work in Oregon.....
Memorandum of Understanding.....
Counties Organized.....
Local Committees.....
Scouting for Blister Rust in California and Oregon....

Blister Rust Control Work in California.....
Ribes Ecology.....
Ribes Reestablishment in Stream Type after Logging...
Ribes Reestablishment after Eradication on Cut Over
Ribes Seed Storage in the Duff and Soil.....
Miscellaneous Studies.....
Summary.....
Ribes Eradication.....
Control Reconnaissance.....
Scouting for Blister Rust in California and Oregon....
Miscellaneous Work.....

Blister Rust Control Work in Colorado and Wyoming.....

Progress in Chemical Investigations.....
Results of 1933 Field Work.....
Field Experiments of 1934.....
Gross Morphology of Stem and Root Systems of
California Ribes.....
Recommendations for the Use of Chemicals in Ribes
Eradication.....

Progress Report of Studies in Effectiveness of Control...
Publication and Advertising Matter.....

Page

Progress Report of Studies in Effectiveness of Control (Continued)
Infection Studies at Long Meadow Creek, Idaho..... 264-269
Infection Studies at Newman Lake, Washington..... 270-279
The Infection of Pines in Plantations after Ribes Eradication..... 280-282
Infection Studies at Cheekye, B.C..... 283-290
The Influence of Weather on the Infection of Pines, Newman Lake, Washington..... 291-292
A Study of the Movement of the Mycelium of Cronartium ribicola Fischer During the Incubation Period in Pinus monticola, Doug..... 293-298

Scouting for White Pine Blister Rust in the Inland Empire.. 299-302
Photographic and Educational Work..... 303-307
Financial Report..... 308-311
General Summary, Western Control Program..... 312-321

Progress Report of Studies in Effectiveness of
Control (Continued)
Infection Studies at Deep Meadow Creek, Idaho..... 283-289
The Influence of Weather on the Infection of Pines
by Cronartium ribicola Fischer During the Incubation Period in
Pinus monticola, Dougl..... 290-298

Scouting for White Pine Blister Rust in the Inland Empire.. 299-302
Photographic and Educational Work..... 303-307
Financial Report..... 308-311
General Summary, Western Control Program..... 312-321

BLISTER RUST WORK IN THE FAR WEST

January 1 to December 31, 1934.

**** - 0 - ****

The calendar year of 1934 was marked by large scale control operations in the western blister rust control work. These operations were carried on by two types of employees, (1) the men of the Civilian Conservation Corps and (2) men employed under Public Works Administration funds. Work by the Civilian Conservation Corps was confined to the Inland Empire and Mount Rainier National Park in western Washington. Public Works Administration funds for blister rust control were made available both to the Forest Service and this Division in Montana, Idaho, Washington, Oregon and California, and smaller allotments were made to this Division for work in Wyoming and Colorado. The result of these allocations of funds and allotments of Civilian Conservation Corps men was that at the height of the season approximately 13,000 men were engaged upon Ribes eradication in western United States. The details of the results are given in the accompanying reports.

Out of the stringent need for adequate technical supervision in these large scale operations there has grown a type of field organization which, so far as can now be determined, is admirably suited to the purposes for which it is intended. This method of organizing field supervision is now being uniformly applied in the western states where Ribes eradication work is going on. The western region is divided into two subregions, the Inland Empire white pine area, and the California and Oregon white and sugar pine area. Should Ribes eradication ever be undertaken in the Central Rocky Mountain area, a third subregion would normally be developed there. Ribes eradication activities in each of these subregions is under the direct responsibility of a regional supervisor, who is responsible to the field supervisor of western blister rust control activities in Spokane. Under the supervision of each regional supervisor his region is divided into operations. An operation is a unit of the Ribes eradication program which by virtue of geographical location, lines of communication, and to a lesser extent land ownership, is readily given field supervision by one technical leader. This technical leader is known as an operation supervisor. His duties are to plan and prosecute blister rust control within the confines of his operation.

The Inland Empire region is thus far divided into five operations, the Clearwater, St. Joe, Coeur d'Alene and Kaniksu operations in Idaho, and the western Montana operation in Montana. The California and Oregon region is divided thus far into four operations, the Stanislaus, Eldorado and Plumas operations in California, and the Oregon operation in Oregon which largely centers in the extreme southwestern portion of the State. The permanent personnel of each operation includes the operation supervisor, an assistant, and a checking supervisor. During the active field season each operation is divided into smaller units under the supervision of a unit supervisor who is a highly experienced blister rust control man, but most of whom are employed upon a temporary basis. Each unit consists of from four to ten camps, the number depending upon the type of territory and the accessibility of the camps. Each camp in turn contains a camp boss and the requisite number of laborers, or in the case of the Civilian Conservation Corps camps a superintendent and the requisite number of foremen who

[illegible] WORK IN THE [illegible]

January 1 to December 31, 1934.

[illegible]

The calendar year of 1934 was marked by large scale control operations in the western blister rust control work. These operations were carried on by two types of employees, (1) the men of the Civilian Conservation Corps and (2) men employed under [illegible]. The Civilian Conservation Corps was confined to the Inland Empire and Rocky Mountain Districts in western Washington. Public Works Administration funds for blister rust control were made available both to the Forest Service and this Division in Montana, Idaho, Washington, Oregon and California, and smaller allotments were made to this Division for work in Wyoming and Colorado. The result of these allocations of the season approximately 15,000 men were employed upon Ribes eradication in [illegible]. The details of the returns are given in the accompanying reports.

Out of the stringent need for adequate technical supervision in these large scale operations there arose a type of field organization which, so far as can now be determined, is entirely suited to the purposes for which it is intended. This method of operating field reservation is now being universally applied in the western white pine areas. The [illegible] was in order. The western region is divided into two sections, the Inland Empire with its [illegible], and the California and Oregon white and sugar pine area. Should other eradicative work be undertaken in the Central Rocky Mountain area, a third region would normally be developed there. Other regulation activities in each of these regions is under the direct responsibility of a regional supervisor, who is responsible to the field supervisor of western blister rust control activities in Spokane. Under the supervision of each regional supervisor his region is divided into operations. An operation is a unit of the Ribes eradication program which by virtue of geographical location, lines of communication, and to a lesser extent land ownership, is readily given field supervision by one individual. This technical leader is known as an operation supervisor. His duties are to plan and prosecute blister rust control [illegible].

The Inland Empire region is thus far divided into five operations, the Clearwater, St. Joe, Coeur d'Alene and Kaniksu operations in Idaho, and the [illegible] operation in Montana. The California and Oregon region is divided thus far into four operations, the Stanislaus, Siskiyou and Plumas operations in California, and the Oregon operation in Oregon which largely centers in the extreme southwestern portion of the State. The [illegible] of each operation includes the operation supervisor, an assistant, and a checking supervisor. During the active field season each operation is divided into smaller units under the supervision of a unit supervisor who is a highly experienced blister rust control man, but most of whom are employed upon a temporary basis. Each unit consists of from four to ten camps, the number depending upon the type of territory and the accessibility of the camps. Each camp in turn contains a camp boss and the requisite number of laborers, or in the case of the Civilian Conservation Corps camps a superintendent and the [illegible] of [illegible]

are experienced in blister rust control work. For the 30 man camps one checker is assigned to each two camps. Each Civilian Conservation Corps camp contains a checker foreman and the number of checkers needed as determined by the number of men in camp assigned to blister rust control work. Each operation establishes a central field headquarters, at which all performance records are assembled and kept up-to-date, and through which all fiscal records pass on their way to the Forest Supervisor's office or to the Spokane blister rust control office.

The organization briefly described above has thus far been found to be highly successful in giving the requisite technical supervision in blister rust control work. Its success is probably measured by the fact that it provides at least the minimum of technical supervision necessary for successful work upon a project highly specialized in nature.

During 1934 the State of Idaho had available an allotment to blister rust control of $30,000. With this exception all other funds directly expended upon Ribes eradication were allocated by the Federal Government.

As in 1933, the major effort in western United States was upon Ribes eradication rather than experimental work. However, the chemical investigations unit has during this period evolved a chemical method for Ribes eradication in the woland types which may play an important part in reducing costs. The method primarily consists of the decapitation of large bushes and the application of small amounts of dry chemical or oil, and is described in detail in the report on this work. It is of particular value on areas containing numerous very large Ribes bushes which have previously demanded a great deal of time to dig out.

Work in the Central Rocky Mountain region for 1934 consisted entirely of reconnaissance, in an effort to locate and study areas containing valuable white pine. The next logical step in this region is the performance of small scale Ribes eradication experiments to determine costs of such work, and it is hoped that these experiments can be undertaken in 1935.

During the calendar year 1934 funds were available to the Division of Plant Disease Control in the far western states by allotments made from Public Works funds, and our regular appropriation for blister rust control work as follows:

PWA Funds 1933 - 1935

F. P. 209-Idaho	$500,000
F. P. 210-Montana	90,000
F. P. 211-Washington	112,000
F. P. 212-California	400,000
F. P. 213-Oregon	50,000
F. P. 214-Wyoming	10,000
F. P. 215-Colorado	10,000
Total	$1,172,000
F. P. 128-Oregon Phys. Imp.	50,000
Total	$1,222,000
Regular Funds Fiscal Year 1934	96,500
Total	$1,318,500

P. T. 209-Idaho	$500,000
P. T. 211-Washington	112,000
P. T. 212-Oregon	80,000
Total	$1,172,000
P. T. 128-Oregon Phys. Imp.	50,000
Total	$1,818,800

Funds were expended during the calendar year 1934 for blister rust control work in the far western states from the above appropriations in the amounts indicated by the following:

(1)	34133.14	Sal. & Exp. Bu. of Plant Industry Blister Rust Control 1934 (1/1/34-6/30/34)	$ 37,338.14
(2)	3-03/5640.10-4	White Pine Blister Rust Control National Industrial Recovery Agriculture B. P. I. 1933-1935 (1/1/34-6/30/34)	282,007.13
(3)	3-03/5640.10.1	National Industrial Recovery Agriculture Plant Industry. (Physical Improvements) 1933-1935 (1/1/34-6/30/34)	13,490.99
(4)	3-03/5640.24-4	National Industrial Recovery - Agriculture Entomology and Plant Quarantine (White Pine Blister Rust) 1933-1935 (7/1/34-12/31/34)	249,916.69
(5)	3-03/5640.24.1	National Industrial Recovery - Agriculture Entomology and Plant Quarantine (Blister Rust Control) 1933-1935 (7/1/34-12/31/34)	20,297.81
			$603,050.76

Items 1, 2 and 3 consisted of funds from the regular annual appropriation, Public Works Administration allotments for blister rust control, and the Public Works Administration allotment for physical improvements, respectively. These funds were recorded in the Bureau of Plant Industry accounting office. Items 4 and 5 consisted of funds transferred from the unexpended balances as of July 1, 1934 in the Bureau of Plant Industry to the Bureau of Entomology and Plant Quarantine and were recorded by the latter accounting office.

Definite allotments by work projects of the funds available for the calendar year 1934 were not made as has been the policy under our regular blister rust control appropriation for the past years. Provision was made to carry the permanent administrative and supervisory personnel and a definite number of regular blister rust camps were assigned to each operation based upon an average cost per camp for the field season and funds available for expenditure.

On April 10, 1934, $186,000 from Project F. P. 212-California were transferred to the Forest Service Region 5 for disbursement by A. W. Smith, regional fiscal agent. Expenditures of approximately $176,578.15 were made during the year for wages, equipment, subsistence supplies and miscellaneous items on a joint basis of cooperative blister rust control work between this Division and the Forest Service carried on in the Plumas, Eldorado and Stanislaus National Forests. Disbursements were made through the Forest Service in order to facilitate more prompt payment of the expenditures made for wages and other expense.

The following is the permanent western personnel who were employed during the period covered by this report:

1. Supervisory:

a. In Charge of Western Branch Office, S. N. Wyckoff, Senior Pathologist.

Funds were expended during the calendar year 1954 for blister rust control work in the five western white pine states listed on the following:

(1)	341853.14	Sal. & Exp. Em. of Plant Industry Blister
(2)	[illegible]	[illegible]
(3)	[illegible]	[illegible]
(4)	[illegible]	Improvements) 1938-1958 (1/1/54-6/30/54) 15,490.36
(5)	[illegible]	Agricultural Entomology and Plant Quar-
		antine (White Pine Blister Rust)
		1938-1958 (7/1/54-12/31/54) 949,916.89
(6)	[illegible]	Agricultural Entomology and Plant Quar-
		antine (Japanese Beetle Control)
		1938-1958 (7/1/54-12/31/54) 30,887.81
		$ 806,458.25

Items 1, 2 and 3 consisted of funds from the regular annual appropriation, Public Works Administration allotments for blister rust control, and the Public Works Administration allotment for Japanese Beetle control, respectively. These funds were recorded in the Bureau of Plant Industry accounting office. Items 4 and 5 consisted of funds transferred from the appropriated Bureau of Entomology and Plant Quarantine and were recorded by the latter accounting office.

July 1, 1954 in the Bureau of Plant Industry to the Bureau of Entomology and

Definite allotments by work projects of the funds available for the fiscal year 1954 were made at the beginning of the year. Provision was made to carry the rust control appropriation for the next years. Provision was made to carry the cost per camp for the field season and funds available for expenditure.

On April 10, 1954, $158,000 from Project N. 5. Old-California were transferred to the Forest Service Region 5 for disbursement by A. W. Smith, regional fiscal agent. Expenditures of approximately $176,578.16 were made during the joint basis of cooperative blister rust control work between this Division and the Forest Service carried on in the Plumas, Mildorado and Stanislaus National Forests. Disbursements were made through the Forest Supervisor in each of the respective areas.

The following is the permanent western personnel who were employed during the period covered by this report:

1. Supervision:

a. In Charge of Western Branch Office, S. M. Wyckoff, Senior Pathologist.

2. Project Leaders:

a. Ribes Ecological Studies, C. W. Waters, Agent, full time summer months, w.a.e., during the winter period.

b. Development of Mechanical Methods of Ribes Eradication. *C. C. Strong, Forester, (transferred to Forest Service October 2, 1934), assisted by J. F. Breakey, Agent.

c. Cooperative Local Control, Idaho. *C. C. Strong, Forester, assisted by Operation Supervisors B. A. Anderson, W. G. Guernsey and H. J. Hartman, Associate Foresters, C. H. Johnson, Associate Pathologist, and F. G. Walters, Agent; Assistant Operation Supervisors, M. C. Riley, Associate Forester, L. L. White, N. D. Nelson, and F. J. Heinrich, Agents; Unit Supervisors, D. F. Williams, S. E. McLaughlin and M. D. Oaks, Agents; and Field Assistants George Heafford and Howard D. Langley, Agents. (H. E. Swanson was placed in charge of Mr. Strong's assignments October 2, 1934.)

d. Checking and Methods of Ribes Eradication. H. E. Swanson, Agent, assisted by Checking Supervisors, W. F. Painter, Junior Forester, H. J. Faulkner, A. L. Pence and H. A. Brischle, Agents; and Assistant in Methods, V. D. Moss, Agent.

e. Cooperative Local Control, National Parks, Washington. *C. C. Strong, Forester, assisted by Unit Supervisor H. F. Geil, Agent.

f. Cooperative Local Control, Oregon. L. N. Goodding, Associate Pathologist, assisted by Unit Supervisor C. P. Wessela, Junior Forester. (W. V. Benedict assumed the responsibilities of Mr. Goodding on April 16, 1934.)

g. Cooperative Local Control, California. W. V. Benedict, Forester, assisted by Operation Supervisors T. H. Harris, D. R. Miller and Roy Blomstrom, Associate Foresters, and F. A. Patty, Associate Pathologist; Unit Supervisors R. M. Riley, Assistant Forester, W. W. Spinney, Benton Howard, Arthur London, Junior Foresters, W. B. Dunshee and J. C. Ball, Agents; Field Assistant R. H. Simons, Agent; and stenographic assistants, Mrs. Martha Boudreau, Junior Typist (resigned March 31, 1934) and Catherine Ryan, Junior Clerk-Stenographer.

h. Informational Work. H. M. Cowling and R. L. MacLeod, Agents, assisted by Dale L. Swartz and W. E. White, Agents.

*For the purpose of coordination and standardization of the various eradication projects (b, c and e) in the Inland Empire white pine belt, these are all placed under the supervision of C. C. Strong, Forester, whose duties were assumed by H. E. Swanson on October 2, 1934.

i. Studies on Spread of the Rust and Damage to Pine. E. L. Joy, Associate Forester, assisted by C. M. Chapman, R. E. Myers, L. E. Nelson, F. F. Staat and Max G. Bicknell, Agents.

w.s., during the winter period.

b. Development of Mechanical Methods of Ribes Eradication. *O. C. Strong, Forester, and E. T. ..., Jr.

c. Cooperative Local Control, Idaho. *O. C. Strong, Forester, assisted by Operation Supervisors R. A. Anderson, V. D. Gwaltney and E. J. Hartman, Associate Entomologist, E. R. ..., Agents: ... I. L. ..., D. F. Williams, E. E. McClenahan and M. D. Oakes, Agents; and Field Assistants George Medford and Howard D. Langley, Agents. (E. E. Swanson was placed in charge of Mr. Strong's assignments October 2, 1934.)

d. Checking and Methods of Ribes Eradication. H. E. Swanson, Agent, assisted by ... A. L. Pence and R. A. Brinkerhoff, Agents; and Assistant in Methods, V. D. ..., Agent.

e. Cooperative ... Project, ... *O. C. Strong, Forester, assisted by ...

f. Cooperative ... Project, ... L. C. ..., assumed the responsibilities of Mr. Goodding on April 16, 1934.)

g. Cooperative ... Project, ... Associate Forester, and E. A. Batty, Associate Pathologist; Visit Supervisors ... Field Assistant J. C. ..., Martha Bourgeau, Junior Typist (resigned March 31, 1934) and Catherine Ryan, Junior Clerk-Stenographer.

h. Information ... Dale E. Swarts and V. E. White, Agents.

*For the purpose of ... gation projects (b, c and e) in the Inland Empire white pine belt, these are all placed under the supervision of C. C. Strong, Forester, whose ...

i. Studies on Spread of the Rust and Damage to Pine. W. L. Doy, Associate ... and Van C. Dicomell, Agents.

j. Experimental Chemical Eradication of Ribes, H. R. Offord, Agent, assisted by C. R. Quick, Junior Microanalyst, R. P. d'Urbal, Assistant Chemist, G. R. Van Atta and J. A. Vogtmann, Agents, and Frances Greenfield, Junior Clerk-Stenographer.

k. Colorado and Wyoming Reconnaissance. E. L. Joy, Associate Forester, assisted by C. M. Chapman, Agent, and seven temporary assistants during the field season.

3. State Leaders:

a. Montana, C. H. Johnson, Associate Pathologist.

b. Oregon, L. N. Goodding, Associate Pathologist, assisted by Mrs. Lillian Knoll, Clerk, (resigned June 30, 1934.) (Goodding transferred to Bureau of Plant Industry, April 16, 1934). State leader not assigned.

c. California, G. A. Root, Associate Pathologist.

4. Business Administration, Disbursing and Clerical Work:

R. L. MacLeod, Agent, (January 1, 1934-February 14, 1934); E. G. Schmidt, Junior Administrative Assistant, (February 15, 1934-December 31, 1934), assisted by Miss M. L. McWold, Senior Clerk and Temporary Special Disbursing Agent, and A. H. Glasgow, R. P. Edgerton, E. A. Ronning, Agents, E. K. LaPrey, Laborer, and Mrs. M. C. Dowdy, Clerk. Mrs. L. E. Klatt, Clerk, assisted by Mrs. E. K. Anderson, Junior Typist, (resigned May 21, 1934), Miss M. V. Lynch, Assistant Clerk-Stenographer, Miss C. Ryan, Junior Clerk-Stenographer (Transferred California April 2, 1934), Miss Agnes L. Anderson, Junior Stenographer (effective May 14, 1934), Miss Mildred Storaasli, Junior Stenographer (resigned May 21, 1934), Mrs. Mildred Hemenway, Assistant Clerk-Stenographer (effective July 1, 1934), Miss Regena R. Rieth, and Mrs. Imogene Hunt (effective May 14, 1934), Junior Typists.

5. Collaborators:

Dr. J. P. Bennett, Berkeley, California (app't. term. January 31, 1934).
Dr. Carl C. Epling, Los Angeles, California.
A. O. Garrett, Salt Lake City, Utah.
Dr. T. H. Goodspeed, Berkeley, California.
Dr. D. R. Hoagland, Berkeley, California (app't. term. January 31, 1934).
Dr. E. E. Hubert, Moscow, Idaho.
B. O. Longyear, Ft. Collins, Colorado.
Rutledge Parker, Missoula, Montana.
F. P. Sipe, Corvallis, Oregon (app't. term. January 31, 1934).

BLISTER RUST CONTROL WORK IN MONTANA
1934

Blister rust control activities in Montana were continued as a cooperative project between the Bureau of Entomology and Plant Quarantine and the Montana Department of Agriculture, Montana Forestry Department, School of Forestry, University of Montana, the Northern Montana Forestry Association, and the Blackfoot Protective Association. There follows the amendment to the basic memorandum of understanding which was drawn up to cover the cooperative work for the fiscal year 1935, beginning July 1, 1934:

BLISTER RUST CONTROL WORK IN MONTANA, 1934

AMENDMENT TO
MEMORANDUM OF UNDERSTANDING
Effective July 1, 1927
Between
THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF ENTOMOLOGY,
THE MONTANA STATE DEPARTMENT OF AGRICULTURE, MONTANA STATE FORESTRY DEPARTMENT,
THE SCHOOL OF FORESTRY, UNIVERSITY OF MONTANA, AND THE
NORTHERN MONTANA FORESTRY ASSOCIATION

Amendment No. 7
Spokane, Washington

Cooperative Work in Controlling White Pine Blister Rust in Montana.

* * *

The undersigned mutually agree that the memorandum of understanding between the United States Department of Agriculture, Bureau of Entomology, the Montana State Department of Agriculture, Montana State Forestry Department, the School of Forestry, University of Montana and the Northern Montana Forestry Association effective July 1, 1927 to continue in effect until June 30, 1928, shall be continued in full force and effect in all its provisions for the fiscal year ending June 30, 1935 with the exception of paragraph F-6 which shall be amended to read as follows:

F-6. That for the fiscal year July 1, 1934 to June 30, 1935 the Montana State Department of Agriculture will expend about $4,000.00; the Montana State Forestry Department about $1,700.00; the School of Forestry, University of Montana about $300.00; the Northern Montana Forestry Association about $1,000.00; the Blackfoot Protective Association, having been added to this agreement in the amendment for the fiscal year ending June 30, 1932, will expend about $1,000.00; and the Federal Government in behalf of the United States Department of Agriculture, Bureau of Entomology about $25,000.00 in connection with the work herein provided for.

The undersigned also mutually agree that this memorandum of understanding shall take effect July 1, 1934 and continue in effect until June 30, 1935, provided that either party may terminate the agreement at any time by a written statement to that effect 30 days in advance of the date of termination desired.

March 22, 1934 — A. H. Stafford
Commissioner, Montana Department of Agriculture.

March 26, 1934 — Rutledge Parker
State Forester, Montana Forestry Department.

March 26, 1934 — I. W. Cook
Act. Dean, School of Forestry, University of Montana

March 26, 1934 — A. E. Boorman
Secretary, Northern Montana Forestry Association.

March 24, 1934 — Roscoe Haines
Secretary, Blackfoot Protective Association.

July 1, 1934 — Lee A. Strong
Chief, Bureau of Entomology and Plant Quarantine,
U. S. Dept. of Agriculture.

...ive Work in Controlling White Pine Blist... Rust in Montana.

* * *

The undersigned mutually agree that the memorandum of understanding between the United States Department of Agriculture, Bureau of Entomology, the Montana State Department of Agriculture, Montana State Forestry Department, the ... of Montana, ... cluding effective July 1, 1937 to continue in effect until June 30, 1938, shall be continued in full force and effect to June 30, 1938, with the exception of paragraph B-6 which shall be amended to read as follows:

B-6. That for the fiscal year July 1, 1937 to June 30, 1938 the Montana ... Department of Agriculture will spend about $6,000.00 in the Montana ... Control Project; ... about $3500.00; the Montana Woolen Company Association about $5,000.00; the Blackfoot Protective Association, having been added to this agreement in the amendment for the fiscal year ending June 30, 1938, will expend about $4,000.00; and the Federal Government in behalf of the United States Department of Agriculture, Bureau of Entomology about $25,000.00 in connection with the work herein provided for.

The undersigned also mutually agree that this memorandum of understanding shall take effect July 1, 1937 and continue in effect until June 30, 1938, provided that either party may terminate the agreement at any time by a written statement to that effect 30 days in advance of the date of termination desired.

March 22, 1937 — A. K. Stanton
Commissioner, Montana Department of Agriculture.

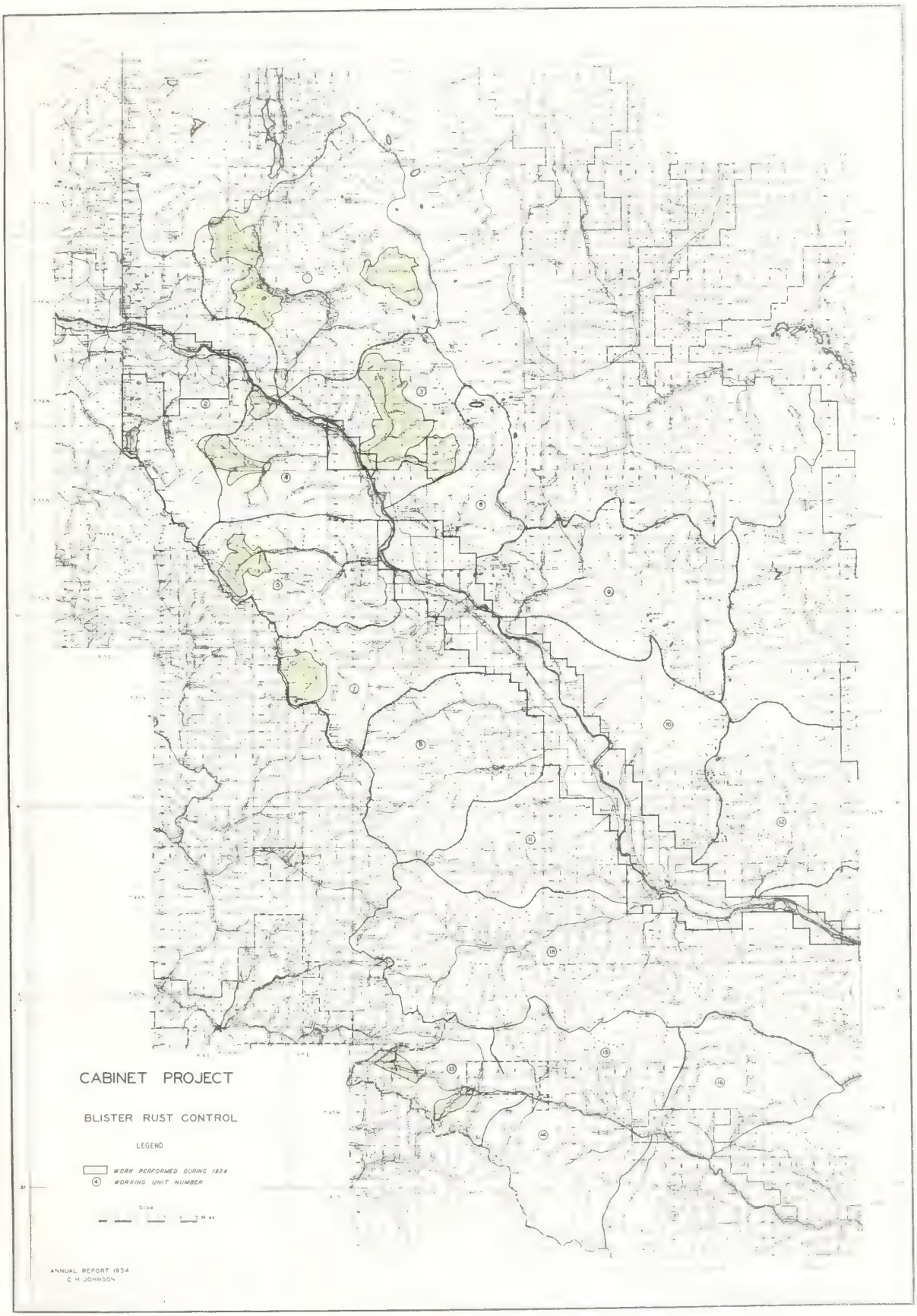
March 25, 1937 — [illegible]

March 25, 1937 — I. O. Ogden
Dept. Dean, School of Forestry, University of Montana

March 25, 1937 — A. K. Stanton
Secretary, Northern Montana Forestry Association.

March 24, 1937 — Reasons Haines
[illegible]

July 1, 1937 — Leo A. Strong
District, Bureau of Entomology and Plant Quarantine,
U. S. Dept. of Agriculture.


CABINET PROJECT
BLISTER RUST CONTROL
LEGEND
WORK PERFORMED DURING 1934
WORKING UNIT NUMBER
ANNUAL REPORT 1934
C. H. JOHNSON

RIBES ERADICATION, CABINET PROJECT, 1934

By
C. H. Johnson, Associate Pathologist,
Division of Plant Disease Control
and
Frank Foltz, Assistant Supervisor
U. S. Forest Service

INTRODUCTION

Prior to the field season of 1934 Ribes eradication on the Cabinet National Forest was confined to a one mile protection zone around a nursery growing white pine seedlings for planting purposes. This nursery is located at Haugan, Montana. In the process of establishing this safety zone, hand and mechanical methods of brush clearing were inaugurated. Cleared brush areas supporting Ribes were converted into grass and pasture lands. These methods have been developed, perfected and applied on other blister rust projects in the Inland Empire.

The 1934 Ribes eradication program on the Cabinet project was conducted jointly by the U. S. Forest Service and the Bureau of Entomology and Plant Quarantine. Twelve camps were financed by the Forest Service and five by the Bureau of Entomology and Plant Quarantine.

LOCATION AND DESCRIPTION OF AREAS

During the 1934 field season control operations were instituted to protect white pine on the more favorable pine sites. Camps were located at the north end of the Cabinet National Forest along Bull River and its tributaries near Noxon, Montana, and also at the extreme south portion of the forest along the St. Regis River, near Taft, Montana.

The area worked was comprised largely of white pine stands of reproduction and pole size, or stands which have withstood the ravages of fires since the early nineties and the conflagration of 1910. A number of plantations established since 1910 were given protection. On the Cabinet there are no large solid blocks of timber containing sufficient white pine to justify the classification as a white pine type. The areas of white pine type within the working units ranged in size from 3,000 to 14,500 acres. The scattered white pine found over extensive areas signifies that since white pine is a dominant species it will constitute one of the most important trees occurring in the more extensive areas of mixed timber species.

Working conditions were representative of what generally is to be expected in a country which reaches high elevations quickly. The north portion of the Cabinet is famous for its ruggedness and steep slopes. Ribes concentrations were so heavy in the upper stretches of the protection zone that it was necessary to discuss and decide on the ground the feasibility of conducting Ribes eradication beyond certain limits.

Ribes viscosissimum, R. lacustre, R. inerme and R. irriguum were the species found to the north along the tributaries of the Clarksfork River. In the southern portion of the district were found: R. petiolare, R. inerme, R. viscosissimum, R. lacustre and R. triste. Working conditions are so heavy along the

Division of Plant Disease Control
and
U. S. Forest Service

INTRODUCTION

Prior to the field season of 1924 White eradication on the Dehlnet
ing white pine seedlings for planting purposes. While numerous in localized areas,
Montana. In the process of establishing this nursery zone, hand and mechanical
methods of brush clearing were inaugurated. Cleared
were converted into grass and pasture lands. These methods have been developed,
perfected and applied on other District projects in the Inland Empire.

The 1924 White eradication program on the Dehlnet project was coordinated
jointly by the U. S. Forest Service and the Bureau of Entomology and Plant Quaran-
tine. Twelve camps were financed by the Forest Service and five by the Bureau of
Entomology and Plant Quarantine.

During the 1924 field season control operations were instituted to
protect white pine on the more favorable pine sites. Camps were located at the
north end of the Dehlnet National Forest along Bull River and the tributaries near
Noxon, Montana, and also at the extreme south portion of the Cabinet along the St.
Regis River, near Taft, Montana.

The area worked was comprised largely of white pine stands of noncommer-
cial pole size, or stands which have withstood the ravages of fires since the
early nineties and the construction of 1910. A number of plantations established
since 1910 were given protection. On the Dehlnet there are no large solid blocks
of timber containing sufficient white pine to justify the classification as a
white pine type. The areas of white pine type within the working units number in
size from 3,000 to 14,500 acres. The scattered white pine found over extensive
areas signifies that since white pine is a dominant species it will constitute one
of the most important trees occurring in the more extensive areas of mixed timber
species.

Working conditions were representative of what generally is to be
beyond certain limits.

St. Regis River and its tributaries that moderate protection costs cannot be achieved.

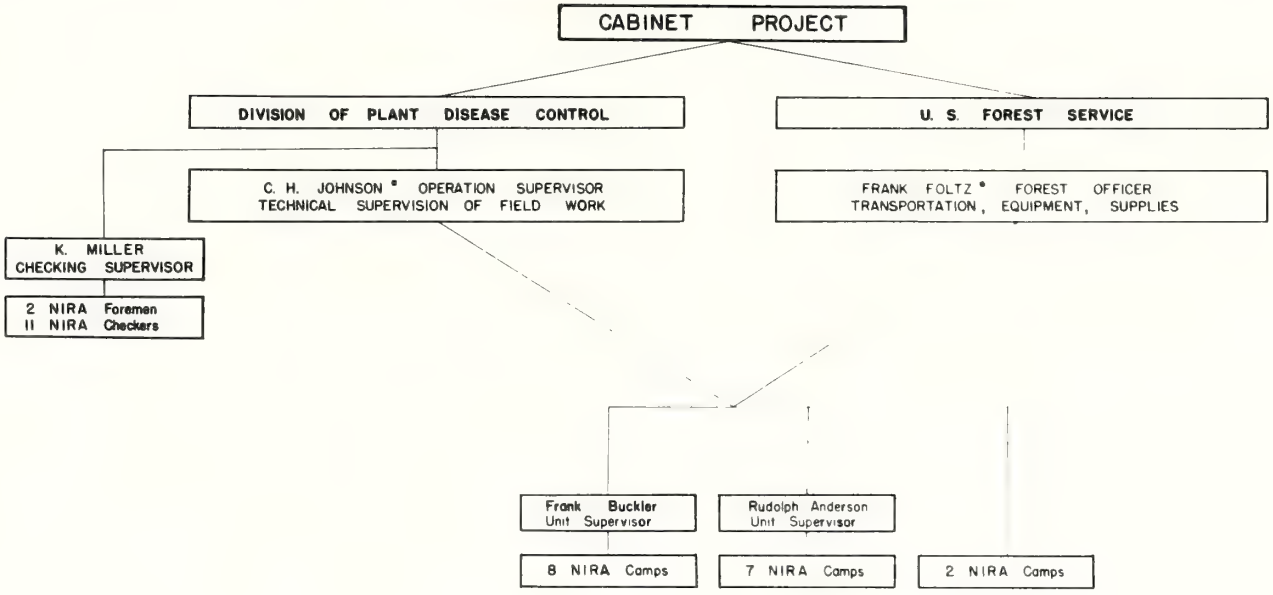
ORGANIZATION AND ADMINISTRATION

All blister rust activities were performed by WPA workers from camps set up at strategic points with reference to areas to be worked. A forest officer of the Cabinet National Forest and a member of the Division of Plant Disease Control were jointly in charge of the project. The forest officer was responsible for transportation and the maintenance of camps. The blister rust representative, with the aid of two unit supervisors, technically supervised the field operations. A foreman in each camp planned and supervised the field work and managed his camp in every detail. A checking supervisor had charge of all checking work.

The personnel in each camp included a nucleus of men with previous experience in blister rust work. Approximately 90 percent of the men were selected from three counties in which the camps were located and had either previous woods or farm experience. The men quickly became adjusted to this new work and performed very well.



ORGANIZATION CHART



SIZE OF NIRA ORGANIZATION

Number of 30-man camps - 17

Total number of men on blister rust work - 551

* Employed full year

WOW

METHODS AND EQUIPMENT

Each camp foreman instructed his men as to the identification of Ribes and the methods of eradication to be used during the season.

The three methods of Ribes eradication which were used on the project were hand pulling, chemical eradication, and the slashing and piling of brush preparatory to burning. The standard three-man crew for hand pulling was used in all camps. Each foreman kept his men closely grouped in order to maintain the closest supervision possible. Crews worked according to topographical features, but generally up and down the slope.

Atlacide was the chemical used for spraying. A solution of 1.5 pounds of Atlacide per gallon of water was used until July 1st; after July 1 the strength of the solution was reduced to one pound of chemical per gallon of water. Only two of the seventeen camps used the spraying method and the chemical was used exclusively on R. petiolare. Two to five-man crews were used on spraying operations.

Hand slashing and piling brush preparatory to burning was used to a limited extent on one area. This work became necessary due to the occurrence of a heavy concentration of R. inerme, which could not be eradicated by the regular chemical treatment. Hand pulling alone was not practical owing to dense thickets of brush. The Ribes were pulled and the brush cut and piled. The brush piles were burned when the danger from forest fires was past.

CHECKING

A checking organization, acting independently of the Ribes eradication unit, checked the efficiency of the work. However, the checkers being experienced in Ribes eradication work, assisted in training new men on eradication work at the start of the season. The checkers cooperated to the fullest extent possible in order to facilitate the progress of the eradication work and to insure efficient work.

All areas which were worked by crews were checked by running parallel strips across the area at 5-chain intervals. The width of strip was 13.2 feet. This constituted a four percent check. A higher percent check was made in stream type areas. The Ribes which were found were plotted along the strip. With this method of recording missed Ribes, any areas on which more than twenty-five feet of Ribes live stem was left were clearly defined in order to show what areas required reworking. There were some areas that were originally free from Ribes which the camp boss eliminated from crew work. The camp boss used somewhat the same method of stripping these areas to determine the extent of the Ribes-free condition. His strips were generally 10 chains apart. Since it was not possible for a checker to go over all of these areas on a four percent check, he checked the area by running strips between those originally taken by the camp boss. This gave a sufficient check on the area to warrant its elimination from the more thorough and costly working by crews. The average cost per acre for checking was $.149.

PREERADICATION

A crew of eight men was engaged on a preeradication survey over the principal remaining white pine areas on the Kootenai and Cabinet National Forests.

Each camp foreman instructed his men as to the identification of Tibes and the methods of eradication to be used during the season.

The three methods of Tibes eradication which were used on the project were hand pulling, chemical application, and top clearing for hand pulling was done preparatory to burning. The chemical crew for hand pulling was used in all camps. Each foreman kept his men closely grouped in order to maintain the closest supervision possible. Crews worked systematically through the area but generally up and down the slope.

Atlacide was the chemical used for spraying. A solution of 1.8 pounds of Atlacide per gallons of water was used for spraying. A solution of 1.5 pounds of the solution was reduced to one pound of Atlacide per gallon of water. Two of the spraying camps used the pressure method and the chemical was applied chiefly on S. pellidisp. The [illegible] were used on spraying operations.

Hand clearing and piling brush preparatory to burning was used to a limited extent on one area. This work became necessary due to the occurrence of a heavy concentration of S. [illegible] which was not eradicated by the previous chemical treatment. Hand pulling alone was not practical owing to dense thickets of brush. The Tibes were pulled and the trash piled. The brush piles were burned when the danger from forest fires was past.

A checking organization, acting independently of the Tibes eradication unit, checked the efficiency of the work. However, the checkers [illegible] experienced in Tibes eradication work, assisted the regular crews in eradication work at the start of the season. The checkers supervised by the District safety engineer [illegible] other to facilitate the progress of the eradication work in the shortest efficient work.

All areas which were worked by crews were checked by running parallel strips across the area at 4-chain intervals. The width of strip was 12.5 feet. This constituted a four percent check. [illegible] Higher percentage check was made in [illegible] type areas. The Tibes which were found were [illegible] along the strip. [illegible] method of recording slipped Tibes, any areas in which more than twenty-five Tibes [illegible] were found [illegible] were classified by crews which [illegible] Tibes were left were classified as "poor" workmanship. There were some areas that were originally free from Tibes which the camp boss eliminated from crew work. The camp boss used somewhat the same method of stripping these areas to determine the extent of the Tibes-free conditions. All strips were generally 10 chains apart. There was a possible for a [illegible] go over all of these areas on a four percent check. He checked the area by running strips between those originally taken by the camp boss. This gave a sufficient check on the area to warrant its elimination from the more thorough and costly working by crews. The average cost per acre for checking was $.14¢.

A crew of eight men was engaged on a preservation survey over the principal remaining Tibes [illegible]

A total of 101,490 acres was covered in this survey.

Each member of the party was assigned two sections as representing a day's work. A meandering course was followed with the purpose of obtaining a good cross section of conditions for future use by eradication crews. Timber types and eradication types were mapped, and age classes and working conditions were recorded. Particular attention was given to Ribes concentrations along streams, with a view to determine the amount of chemicals necessary as well as the ultimate cost of conducting eradication over any particular area.

All of the important white pine producing areas on the Cabinet and Kootenai National Forests have been covered by a preeradication survey.

STATEMENT OF EXPENDITURES AND COSTS

The statement of expenditures and costs includes those funds expended from NIRA allotments to the United States Forest Service and the Bureau of Entomology and Plant Quarantine, in addition to funds disbursed from regular appropriations allotted to these organizations for blister rust control work.

TABLE NO. 1

EXPENDITURES BY APPROPRIATIONS

Cooperating Agency	Appropriation	Amount
Forest Service	Impnira	$ 147,978.80
	Lieunira	644.10
	Other	22.40
	Total	148,645.30
Bureau of Entomology and Plant Quarantine	Regular	3,286.37
	Nira - Montana	65,102.42
	Total	68,388.79
Total Expenditures		$ 217,034.09

A total of 101,490 acres was covered in this survey.

Each member of the party was assigned two sections as described in a [illegible]. A good cross section of conditions for future use by eradication crews. Under types and eradication types were mapped, and age classes and working conditions were recorded. Particular attention was given to Bibee concentrations along streams, with a view to determine the amount of chemicals necessary as well as the ultimate cost of conducting eradication over any particular area.

All of the important white pine producing areas on the Deschutes National Twelve Mile Dam County [illegible] eradication survey.

SUMMARY OF EXPENDITURES AND COSTS

The estimate of expenditures and costs [illegible] from this office allotment to the United States Forest Service and the Bureau of Entomology and Plant Quarantine, in addition to funds diverted from regular appropriations allotted to these organizations for [illegible].

EXPENDITURES BY APPROPRIATION

Cooperating Agency	Appropriation	Amount
Forest Service	Immunia	$ 147,970.00
	Zienuria	614.10
	Sinea	86.40
	Total	148,670.50
Bureau of Entomology	Regular	3,286.47
	Delta - Montana	83,103.43
	Total	[illegible]
Total Expenditures		$ 235,060.40

TABLE NO. 2

CLASSIFIED EXPENDITURES

Item	Nira
Salaries, permanent men	$ 7,197.89
Wages, temporary men	146,116.89
Subsistence supplies	30,545.48
Equipment	17,391.68
Other supplies	8,688.13
Transportation and travel	7,094.02
Total expenditures	217,034.09
Less 2/3 cost of new equipment and trucks	11,672.95
Less cost of 1934 preeradication on Kootenai	902.74
Plus 1/3 cost of 1933-33 equipment and trucks	850.86
Plus cost 1933 preeradication on Cabinet	981.83
Net Cost of 1934 Operation	$206,291.09

Additional cost information:

Effective man-day cost - NIRA (hand eradication)..... $8.29
Effective man-day cost - NIRA (chemical eradication)..... $8.31
Food cost per man-day..... $ .6068
Number of pounds of twine used.....7,037 Cost $2,111.10
Number of pounds of Atlacide used... 15,500 Cost $1,094.46

Number of pounds of Atlacide used... 15,800 Cost $1,004.46
Number of pounds of twine used.....7,037 Cost $2,111.10
Food cost per man-day..... $ .6088
Effective man-day cost - MIRA (chemical eradication)..... $8.31
Effective man-day cost - MIRA (hand eradication)..... $8.39

TABLE NO. 3

SUMMARY OF RIBES ERADICATION 1934
CABINET PROJECT
FIRST WORKING

Name	Eradication Type	Acres	Effective Man Days	Total Ribes	Gallons Spray	Total Cost	Per Acre Basis			
							Man Days	Ribes	Gallons Spray	Cost
NIRA Camps	Open Reproduction	16,818	9,106	2,590,816		$ 75,294.78	.54	154		$ 4.48
	Dense Reproduction	1,612	438	71,747		3,621.69	.27	45		2.25
	Open Pole	11,538	4,875	1,089,176		40,309.91	.42	94		3.49
	Dense Pole	2,265	718	157,851		5,936.93	.32	70		2.62
	Open Mature	6,618	3,206	882,971		26,509.69	.48	133		4.00
	Dense Mature	557	88	8,566		727.65	.16	15		1.31
	Brush	2,193	1,895	573,939		15,669.42	.86	262		7.15
	All Upland	41,601	20,326	5,375,066		168,070.07	.49	129		4.04
	Stream (hand)	2,380	3,920	1,435,982		32,413.40	1.65	601		13.62
	Stream (slash)	7	150			1,240.31	21.43			177.19
	Stream (chemical)	262	420		10,417	4,567.31	1.60		40	17.44
	All Stream	2,387	4,490	1,435,982		38,221.02	1.88	601		16.01
	Total	43,988	24,816	6,811,048		$206,291.09	.56	155		$ 4.69

TABLE NO. 4

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION 1934
CABINET PROJECT

Working	No. of Acres Worked by Ownership Classes			Total Acres
	Federal	State-Montana	Private	
First	36,796	435	6,757	43,988

TABLE NO. 3

SUMMARY OF RIBS EMBODIMENT 1934
CABINET PROJECT
Fiber Bushing

Item	Description	Number	Effective Mfr. Area	Total Ribs	Gallons Epoxy	Total Wgt.	Ribs Thick	Ribs Strength	Ribs Density	Cost
	Glass Reinforcing	16,615	9,406	8,290,854		2,724,278	.54	1.64		4.46
	Dense Reinforcing	1,412	412	71,742		48,021	.27	.85		2.05
	Outer Pole	11,459	6,375	3,028,176		40,320.91	.44	.64		3.40
	Torque Pole	2,355	710	182,004		4,564.84	.34	.70		3.05
	Inner Matrix	6,756	3,854	446,472		21,045.6	.84	1.65		4.14
	Inner Fibers	524	40	6,560		277.46	.16	.74		3.
	Struts	4,752	1,815	877,560		16,460.42	.42	.76		3.11
	All Struts	31,403	16,454	1,734,402		174,070.07	.40	1.67		4.04
	Struts (Panel)	2,344	1,850	1,454,706		41. 1.36		1.61		3.41
	Struts (Glass)	7	130			340.41				3.11
	Struts (Coupled)	3,351	450		10,000	3,347.41	.40		.40	3.44
	All Struts	1,217	1,000	1,000,000		84,251.	.35	.85		3.41
	Total	49,710	28,116	16,017,048		1,000,000	.35	.55		3.

TABLE NO. 4

CABINET PROJECT

Item	No. of Items Worked by Diameter			Total Items
	Faceted	Table-Leaf	Private	
Item	[illegible]	[illegible]	6,577	49,058

TABLE NO. 5

RESULTS OF CHECKING ON AREAS WORKED DURING 1934
CABINET PROJECT

Eradication Type	Regular Check on Worked Areas															
	Acres in Checked Area	Acres Checked	Percent Check	Ribes per Acre												
				R. lac.		R. visc.		R. pet.		R. inerme		R. irrig.		All Species		Seed-lings
				No.	FLS	No.	FLS	No.	FLS	No.	FLS	No.	FLS	No.	FLS	
O. R.	16.818	514	3.1	3	20	2	11			1	1	1	1	7	33	1
D. R.	1.612	49	3.0	1	5	2	16							3	21	1
O. P.	11.538	396	3.4	2	13	2	10			1	1	1	4	6	28	1
D. P.	2.265	92	4.1	1	6	1	1			1	1			3	8	1
O. M.	6.618	222	3.4	3	20	1	5					1	1	5	26	1
D. M.	557	20	3.6	1	2									1	2	1
Brush	2.193	55	2.5	2	7	5	18					1	1	8	26	1
All Upland	41.601	1.348	3.2	2	15	2	10			1	1	1	1	6	27	1
All Stream	2.387	282	11.8	7	38	1	1	3	19	1	1	1	1	13	60	2

TABLE NO. 3

RESULTS OF DRILLING AT LEGAL MINING DISTRICT, 1934
CASTLE PEAK AREA

| Township or Range | Acres in Claims | Acres Covered | Percent Shown | Number Claims Drilled | Number Holes Drilled | Total Feet Drilled | Number Holes Showing Ore | Number Holes Showing Pay Ore | Number Holes Showing Commercial Ore | Number Holes Showing Ore Below Water Level | Number Holes Showing Ore Above Water Level | Number Holes Showing Ore Below Tunnel Level | Number Holes Showing Ore Above Tunnel Level | Number Holes Showing Ore Below Shaft Level | Number Holes Showing Ore Above Shaft Level | Number Holes Showing Ore Below Drift Level | Number Holes Showing Ore Above Drift Level | Number Holes Showing Ore Below Raise Level | Number Holes Showing Ore Above Raise Level | Number Holes Showing Ore Below Winze Level | Number Holes Showing Ore Above Winze Level | Number Holes Showing Ore Below Stope Level | Number Holes Showing Ore Above Stope Level | Number Holes Showing Ore Below Crosscut Level | Number Holes Showing Ore Above Crosscut Level | Number Holes Showing Ore Below Adit Level | Number Holes Showing Ore Above Adit Level | Number Holes Showing Ore Below Open Cut Level | Number Holes Showing Ore Above Open Cut Level | Number Holes Showing Ore Below Surface Level | Number Holes Showing Ore Above Surface Level | Number Holes Showing Ore Below Bedrock Level | Number Holes Showing Ore Above Bedrock Level | Number Holes Showing Ore Below Overburden Level | Number Holes Showing Ore Above Overburden Level | Number Holes Showing Ore Below Gravel Level | Number Holes Showing Ore Above Gravel Level | Number Holes Showing Ore Below Clay Level | Number Holes Showing Ore Above Clay Level | Number Holes Showing Ore Below Sand Level | Number Holes Showing Ore Above Sand Level | Number Holes Showing Ore Below Silt Level | Number Holes Showing Ore Above Silt Level | Number Holes Showing Ore Below Peat Level | Number Holes Showing Ore Above Peat Level | Number Holes Showing Ore Below Muck Level | Number Holes Showing Ore Above Muck Level | Number Holes Showing Ore Below Humus Level | Number Holes Showing Ore Above Humus Level | Number Holes Showing Ore Below Topsoil Level | Number Holes Showing Ore Above Topsoil Level | Number Holes Showing Ore Below Subsoil Level | Number Holes Showing Ore Above Subsoil Level | Number Holes Showing Ore Below Hardpan Level | Number Holes Showing Ore Above Hardpan Level | Number Holes Showing Ore Below Caliche Level | Number Holes Showing Ore Above Caliche Level | Number Holes Showing Ore Below Adobe Level | Number Holes Showing Ore Above Adobe Level | Number Holes Showing Ore Below Loam Level | Number Holes Showing Ore Above Loam Level | Number Holes Showing Ore Below Marl Level | Number Holes Showing Ore Above Marl Level | Number Holes Showing Ore Below Chalk Level | Number Holes Showing Ore Above Chalk Level | Number Holes Showing Ore Below Limestone Level | Number Holes Showing Ore Above Limestone Level | Number Holes Showing Ore Below Sandstone Level | Number Holes Showing Ore Above Sandstone Level | Number Holes Showing Ore Below Shale Level | Number Holes Showing Ore Above Shale Level | Number Holes Showing Ore Below Slate Level | Number Holes Showing Ore Above Slate Level | Number Holes Showing Ore Below Granite Level | Number Holes Showing Ore Above Granite Level | Number Holes Showing Ore Below Basalt Level | Number Holes Showing Ore Above Basalt Level | Number Holes Showing Ore Below Andesite Level | Number Holes Showing Ore Above Andesite Level | Number Holes Showing Ore Below Rhyolite Level | Number Holes Showing Ore Above Rhyolite Level | Number Holes Showing Ore Below Obsidian Level | Number Holes Showing Ore Above Obsidian Level | Number Holes Showing Ore Below Pumice Level | Number Holes Showing Ore Above Pumice Level | Number Holes Showing Ore Below Tuff Level | Number Holes Showing Ore Above Tuff Level | Number Holes Showing Ore Below Breccia Level | Number Holes Showing Ore Above Breccia Level | Number Holes Showing Ore Below Conglomerate Level | Number Holes Showing Ore Above Conglomerate Level | Number Holes Showing Ore Below Quartzite Level | Number Holes Showing Ore Above Quartzite Level | Number Holes Showing Ore Below Schist Level | Number Holes Showing Ore Above Schist Level | Number Holes Showing Ore Below Gneiss Level | Number Holes Showing Ore Above Gneiss Level | Number Holes Showing Ore Below Migmatite Level | Number Holes Showing Ore Above Migmatite Level | Number Holes Showing Ore Below Amphibolite Level | Number Holes Showing Ore Above Amphibolite Level | Number Holes Showing Ore Below Eclogite Level | Number Holes Showing Ore Above Eclogite Level | Number Holes Showing Ore Below Peridotite Level | Number Holes Showing Ore Above Peridotite Level | Number Holes Showing Ore Below Serpentinite Level | Number Holes Showing Ore Above Serpentinite Level | Number Holes Showing Ore Below Dunite Level | Number Holes Showing Ore Above Dunite Level | Number Holes Showing Ore Below Pyroxenite Level | Number Holes Showing Ore Above Pyroxenite Level | Number Holes Showing Ore Below Hornblendite Level | Number Holes Showing Ore Above Hornblendite Level | Number Holes Showing Ore Below Gabbro Level | Number Holes Showing Ore Above Gabbro Level | Number Holes Showing Ore Below Diabase Level | Number Holes Showing Ore Above Diabase Level | Number Holes Showing Ore Below Diorite Level | Number Holes Showing Ore Above Diorite Level | Number Holes Showing Ore Below Syenite Level | Number Holes Showing Ore Above Syenite Level | Number Holes Showing Ore Below Monzonite Level | Number Holes Showing Ore Above Monzonite Level | Number Holes Showing Ore Below Granodiorite Level | Number Holes Showing Ore Above Granodiorite Level | Number Holes Showing Ore Below Quartz Diorite Level | Number Holes Showing Ore Above Quartz Diorite Level | Number Holes Showing Ore Below Tonalite Level | Number Holes Showing Ore Above Tonalite Level | Number Holes Showing Ore Below Trondhjemite Level | Number Holes Showing Ore Above Trondhjemite Level | Number Holes Showing Ore Below Aplite Level | Number Holes Showing Ore Above Aplite Level | Number Holes Showing Ore Below Pegmatite Level | Number Holes Showing Ore Above Pegmatite Level | Number Holes Showing Ore Below Vein Level | Number Holes Showing Ore Above Vein Level | Number Holes Showing Ore Below Stockwork Level | Number Holes Showing Ore Above Stockwork Level | Number Holes Showing Ore Below Replacement Level | Number Holes Showing Ore Above Replacement Level | Number Holes Showing Ore Below Contact Level | Number Holes Showing Ore Above Contact Level | Number Holes Showing Ore Below Fault Level | Number Holes Showing Ore Above Fault Level | Number Holes Showing Ore Below Fracture Level | Number Holes Showing Ore Above Fracture Level | Number Holes Showing Ore Below Joint Level | Number Holes Showing Ore Above Joint Level | Number Holes Showing Ore Below Bedding Plane Level | Number Holes Showing Ore Above Bedding Plane Level | Number Holes Showing Ore Below Unconformity Level | Number Holes Showing Ore Above Unconformity Level | Number Holes Showing Ore Below Disconformity Level | Number Holes Showing Ore Above Disconformity Level | Number Holes Showing Ore Below Nonconformity Level | Number Holes Showing Ore Above Nonconformity Level | Number Holes Showing Ore Below Paraconformity Level | Number Holes Showing Ore Above Paraconformity Level | Number Holes Showing Ore Below Angular Unconformity Level | Number Holes Showing Ore Above Angular Unconformity Level | Number Holes Showing Ore Below Parallel Unconformity Level | Number Holes Showing Ore Above Parallel Unconformity Level | Number Holes Showing Ore Below Overlap Level | Number Holes Showing Ore Above Overlap Level | Number Holes Showing Ore Below Offlap Level | Number Holes Showing Ore Above Offlap Level | Number Holes Showing Ore Below Transgression Level | Number Holes Showing Ore Above Transgression Level | Number Holes Showing Ore Below Regression Level | Number Holes Showing Ore Above Regression Level | Number Holes Showing Ore Below Eustatic Level | Number Holes Showing Ore Above Eustatic Level | Number Holes Showing Ore Below Isostatic Level | Number Holes Showing Ore Above Isostatic Level | Number Holes Showing Ore Below Tectonic Level | Number Holes Showing Ore Above Tectonic Level | Number Holes Showing Ore Below Orogenic Level | Number Holes Showing Ore Above Orogenic Level | Number Holes Showing Ore Below Epeirogenic Level | Number Holes Showing Ore Above Epeirogenic Level | Number Holes Showing Ore Below Geosynclinal Level | Number Holes Showing Ore Above Geosynclinal Level | Number Holes Showing Ore Below Miogeosynclinal Level | Number Holes Showing Ore Above Miogeosynclinal Level | Number Holes Showing Ore Below Eugeosynclinal Level | Number Holes Showing Ore Above Eugeosynclinal Level | Number Holes Showing Ore Below Cratonic Level | Number Holes Showing Ore Above Cratonic Level | Number Holes Showing Ore Below Shield Level | Number Holes Showing Ore Above Shield Level | Number Holes Showing Ore Below Platform Level | Number Holes Showing Ore Above Platform Level | Number Holes Showing Ore Below Basin Level | Number Holes Showing Ore Above Basin Level | Number Holes Showing Ore Below Geanticline Level | Number Holes Showing Ore Above Geanticline Level | Number Holes Showing Ore Below Geosyncline Level | Number Holes Showing Ore Above Geosyncline Level | Number Holes Showing Ore Below Miogeosyncline Level | Number Holes Showing Ore Above Miogeosyncline Level | Number Holes Showing Ore Below Eugeosyncline Level | Number Holes Showing Ore Above Eugeosyncline Level | Number Holes Showing Ore Below Cratonic Level | Number Holes Showing Ore Above Cratonic Level | Number Holes Showing Ore Below Shield Level | Number Holes Showing Ore Above Shield Level | Number Holes Showing Ore Below Platform Level | Number Holes Showing Ore Above Platform Level | Number Holes Showing Ore Below Basin Level | Number Holes Showing Ore Above Basin Level | Number Holes Showing Ore Below Geanticline Level | Number Holes Showing Ore Above Geanticline Level | Number Holes Showing Ore Below Geosyncline Level | Number Holes Showing Ore Above Geosyncline Level | Number Holes Showing Ore Below Miogeosyncline Level | Number Holes Showing Ore Above Miogeosyncline Level | Number Holes Showing Ore Below Eugeosyncline Level | Number Holes Showing Ore Above Eugeosyncline Level |
|---|---|---

BLISTER RUST CONTROL WORK IN IDAHO
1934

Blister rust control activities in Idaho were continued as a cooperative project in accordance with the agreement originally executed between the Bureau of Plant Industry and the Idaho State Department of Agriculture, the Idaho State Land Board, the Idaho State Board of Forestry, the University of Idaho, the Clearwater Timber Protective Association, the Potlatch Timber Protective Association, the Coeur d'Alene Timber Protective Association, the Pend Oreille Timber Protective Association, and the Priest Lake Timber Protective Association.

The general memorandum, effective July 1, 1931 and to remain in effect indefinitely, is shown in the 1931 annual report. Amendment No. 2 was, however, executed to the agreement between the Bureau of Plant Industry and the State Land Department of the State of Idaho to cover cooperative local control work on white pine lands owned by the State of Idaho. This amendment is as follows:

AMENDMENT TO
MEMORANDUM OF UNDERSTANDING
Effective April 1, 1931
Between
THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY
AND THE STATE LAND DEPARTMENT, STATE OF IDAHO

Amendment No. 2
Spokane, Wash.

Cooperative Work in Controlling White Pine Blister Rust in Idaho

* * *

The undersigned mutually agree that the memorandum of understanding between the United States Department of Agriculture, Bureau of Plant Industry, and the State Land Department, State of Idaho, effective April 1, 1931, to continue in effect until March 31, 1932, shall be continued in full force and effect in all its provisions for the period April 1, 1934, to March 31, 1935, with the exception of paragraphs B-5, C-1 and D, which shall be amended to read as follows:

B-5. For the period April 1, 1934, to March 31, 1935, the Federal Government in behalf of the United States Department of Agriculture, Bureau of Plant Industry will expend about $30,000 in connection with the work herein provided for.

C-1. Expend about $30,000.00 upon this cooperative project for the period April 1, 1934 to March 31, 1935. This contribution to be paid into the Treasury of the United States, in such installments and at such times as the Bureau of Plant Industry considers necessary for the proper prosecution of the work, and to be disbursed by the properly authorized officials of the Bureau of Plant Industry.

D. For the period stated above, this cooperative control work shall be performed in Working Units 6 and 7, in the vicinity of Priest Lake, Idaho.

The undersigned also mutually agree that this memorandum shall take effect April 1, 1934 and continue in effect until March 31, 1935, provided that

1934

Blister rust control activities in Idaho were continued as a cooperative project in accordance with the agreement originally executed between the Bureau of Plant Industry and the Idaho State Department of Agriculture, the Idaho State Board of Forestry, the University of Idaho, the Clearwater Timber Protective Association, the Potlatch Timber Protective Association, the Upper St. Joe Timber Protective Association, the Coeur d'Alene Timber Protective Association, and the Priest Lake Timber Protective Association.

The general memorandum, effective July 1, 1931 and to remain in effect indefinitely, is given in the 1931 annual report. Amendment No. 7, executed to the agreement between the Bureau of Plant Industry and the State Board Department of the State of Idaho to cover cooperative local control work on white pine lands owned by the State of Idaho. This amendment is as follows:

Amendment No. 7

to

Cooperative Project

Between

THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY

and

Cooperatives are in Controlling Blister Rust in

A. [illegible]

The undersigned mutually agree that the memorandum of understanding between the United States Department of Agriculture, Bureau of Plant Industry, and the State Land Department, State of Idaho, effective April 1, 1931, is modified in effect until March 31, 1935, shall be continued in full force and effect in all its provisions for the period April 1, 1934, to March 31, 1935, with the modification of paragraphs B-D; C-J and E-G as follows:

B-C. For the period April 1, 1934, to March 31, 1935, the Bureau of Plant Industry will expend funds [illegible] provided for.

C-J. Expend about $80,000.00 upon this cooperative project for the period April 1, 1934 to March 31, 1935. This contribution to be paid into the Treasury of the United States, in such [illegible] of Plant Industry Cooperative Account No. [illegible] to be disbursed by the properly authorized officials of the Bureau of Plant Industry.

D. For the period stated above, this cooperative control work shall be performed in Cooling Units 6 and 7, in the vicinity of Priest Lake.

The undersigned also mutually agree that [illegible] effect April 1, 1931 and continue in effect until March 31, 1935, unless [illegible]

either party may terminate the agreement at any time by a written statement to that effect 30 days in advance of the date of termination desired.

C. Ben Ross
President of the State Board of Land Commissioners

Countersigned:

Robert Coulter
State Land Commissioner, State of Idaho

K. F. Kellerman
Acting Chief, Bureau of Plant Industry,
U. S. Department of Agriculture

Franklin Girard
Secretary of State

RIBES ECOLOGY IN THE INLAND EMPIRE

By
Charles W. Waters
Agent

INTRODUCTION

The greater part of the 1934 field season was spent in carrying on to completion the field studies initiated in 1932 which represent an attempt to determine the effects of cutting methods on Ribes seed germination and seedling survival.

In addition, a beginning was made on what is hoped will develop into cooperative studies between this Office and the Northern Rocky Mountain Experiment Station of the Forest Service at the Deception Creek Experimental Forest in the Coeur d'Alene National Forest. Only two small plots were established this year; additional plots will be established during the field season of 1935.

The methods and results of the studies carried on this year are given below:

I. EFFECTS OF CUTTING METHODS ON RIBES SEED GERMINATION AND SEEDLING SURVIVAL

This project begun in 1932 and completed this year is described on Pages 33-37 of the 1932 Annual Report, and Pages 14-19 of the 1933 Annual Report.

Since a complete treatment of this study will be presented soon in the form of a research paper, only a summarized account of the methods, results and conclusions will be given here.

During the field season of 1932, 1,472 acres of cut-over lands were studied, located mainly within the Clearwater holdings of Potlatch Forests, Inc. This included lands which had been clear-cut and broadcast burned; lands which had been selectively logged with the brush piled and burned; and a few areas which had been disturbed through construction of logging railroads.

During 1933, 9,454 additional acres were covered. These lands lying mainly in or near what is now known as the Palouse Division of the St. Joe National Forest had all been privately logged, and represented as wide a diversity of logging methods as it was possible to obtain. No cut-over lands were included which had been logged prior to 1928.

In addition to a careful Ribes count on the areas, data were taken on all coniferous reproduction and a count made of the numbers of residual trees remaining on the areas.

The results of the study will be taken up according to the years during which the work was performed. Since the results as reported in the Annual Reports for 1932 and 1933 were preliminary in their nature, figures and other data which are reported here in final form will be somewhat at variance with them.

INTRODUCTION

The greater part of the 1954 field season was spent in carrying on an investigation of the effects of cutting methods on Abies seed germination and seedling survival.

In addition, a supplementary study was made of the [illegible] compartive studies [illegible] Station of the Forest Service at the Deception Creek Experimental Forest in the Coeur d'Alene National Forest. Only two small plots were established this year; additional plots will be established during the field season of 1955.

The methods and results of the studies carried on this year are given below:

I. [illegible]

This project began in 1952 and completed this year is described on Pages [illegible] of the 1953 Annual Report, and Pages [illegible] of the 1954 Annual Report.

Since a complete treatment of this study will be presented soon in the form of a research paper, only a condensed account of the methods, results and conclusions will be given here.

During the field season of 1952, 1,472 acres of cut-over lands were surveyed, located mainly within the [illegible] This included lands which had been clear-cut and [illegible] had been selectively logged with the forest [illegible] and a few plots which had been disturbed through construction of logging railroads.

During 1953, 2,464 additional acres were covered. These [illegible] mainly in or near what is now known as the Palouse Division of the St. Joe National Forest had all been privately logged, and presented an [illegible] ging methods as it was possible to obtain. In [illegible] had been logged prior to 1938.

In addition to a careful Abies count on the areas, data were taken on all conditions regarding [illegible] and a record made of the number of [illegible] standing on the areas.

The results of the study will be taken up according to the years during which the work was performed. Since the period is covered in the [illegible] for 1952 and 1953 were preliminary to their nature, figures and [illegible] are reported here in final form will be summed at various [illegible]

A. Results of Studies Conducted During 1932

1. Ribes seed germination. Disturbances brought about by railroad construction produced the greatest numbers of Ribes viscosissimum.[1] Clear cutting, followed by broadcast burning of the brush, was responsible for the next greatest numbers, showing an average of 1,900.7 Ribes per acre, or about one-fifth as great as disturbances produced by railroad construction.

Logging on a selective basis, such as practiced by the Clearwater Timber Company, was responsible for bringing in the lowest numbers of Ribes; the general average per acre being 506.4, or one-fourth the number produced by clear cutting and less than one-eleventh the number produced by disturbances incidental to railroad grading.

The explanation advanced to account for these results is that while clear cutting followed by broadcast burning may produce as extensive disturbances as railroad grading, in the former operation, many seeds are destroyed by the burn. In the case of selective cutting followed by brush piling and burning, the smaller percentage of ground surface disturbed by the logging and fire, necessarily brings in a proportionately lower number of Ribes.

That brush burning, which is presumed to accompany every logging operation, is the prime factor in bringing in Ribes, was brought out by checking the time of logging and burning and the time when the peak of Ribes seed germination occurred. In every case, the peak of germination occurred the year following the burning regardless of when the area was logged. This was shown specifically in the case of two groups of areas which were logged in 1929 and 1930 respectively. In both groups the burning was done in 1930. The peak of germination occurred in all the areas in 1931 regardless of the fact that the one group had been logged a year previous to the other. Another case in point which showed the effects of burning on Ribes production was brought out between two comparable groups of logged over areas. Both of these groups represented exactly the same type of logging; they were logged the same year but in the one the brush was piled and burned, while in the other the brush was piled but not burned. The number of Ribes per acre in the burned group reached a total of 1,694.8, while in the unburned group only 129.5 Ribes appeared. This is less than one-thirteenth the number which appeared in the area on which burning had followed the actual cutting operations.

2. Ribes seedling survival. It has been shown that the number of Ribes seeds which germinate on an area, provided it be a Ribes site, are wholly dependent on the type and degree of disturbance to which the area is subjected. The extent to which the resulting seedlings survive and develop appears to depend largely on the density of the canopy formed by the residual trees which are left on the area following the disturbance. This latter conclusion was reached as a result of comparisons made between areas which had been clear cut in 1927-28

[1] Upon final completion of the field data it was found that due to the differences which exist between R. lacustre and R. viscosissimum in their site requirements, these two species present separate problems. In this report only R. viscosissimum is considered so that when the term Ribes is used, R. viscosissimum is implied.

A. Results of Studies Conducted During 1932

1. Slash seed conditions. Disturbances brought about by [illegible] increased the general number of Tribes discovered. [illegible] followed by broadcast burning of the brush, was responsible for the most greatest numbers, showing an average of 1,500.7 Tribes per acre, or about the [illegible] as disturbances produced by railroad construction.

Logging on a selective basis, such as practiced by the Sierra Timber Company, was responsible for tripling in the Tyrio quality of [illegible] several average per acre being 594.4, or one-fourth the number produced by clear cutting and less than one-eleventh the number produced by disturbances to railroad grading.

The explanation advanced to account for these results is that while clear cutting followed by prescribed burning may produce as effective disturbance as railroad grading, in the former operation, many Tribes are destroyed by the burn. In the case of selective cutting followed by fires [illegible] smaller percentage of ground surface disturbed by the logging, materially brings in a proportionately lower number of Tribes.

That brush burning, which is presumed to accompany every logging operation, is the prime factor in bringing in Tribes. The [illegible] the time of logging and burning and the time when the real of Tribe seed germination occurred. In every case, the peak of germination occurred the year following the burning regardless of when the area was logged. This was especially in the case of two groups of areas which were logged in 1930 and 1931 respectively. In both groups the burning was done in 1931. The peak of germination occurred in all but three in 1932 regardless of the fact that the group had been logged a year previous to the other. Another case in point which showed the effects of burning on Tribe production was brought out between two contrasting groups of logged over areas. Both of these areas [illegible] the same type of logging; they were logged the same year and the [illegible] was piled and burned, while in the other the brush was [illegible]. The number of Tribes per acre in the burned group reached a total of 1,594.6, while in the unburned group only 150.6 Tribes appeared. This is [illegible] the number which appeared in the area on which burning but followed the actual cutting operations.

2. Tribes resist survival. It has been shown that the number of Tribes seeds which germinate on an area, provided it be a Tribes site, are mostly dependent on the type and degree of disturbance to which the area is subjected. The extent to which the resulting seedling survive and develop depends largely on the density of the canopy formed by the residual stand. Tribes which are left on the area following the disturbance. This factor [illegible] as a result of competition made between trees which has been [illegible] Upon final completion of the field data it was found that in the difference which exist between E. [illegible] and E. viridescens in their resistance. [illegible] have two species present marked [illegible] In this respect only E. [illegible] is considered so that when the term Tribes is used, E. viridescens is [illegible].

and selectively cut areas which were logged at practically the same time. The former in 1932 showed an average Ribes count of 1,900.7 plants per acre. Of these almost 50 percent had reached the age of two years which meant that they were fairly well established since previous studies have indicated that after the first year very few Ribes fail to survive on areas from which the canopy has been removed.

On the selectively logged areas which were comparable to the clear cut areas in the time of logging and burning, only 86.0 Ribes per acre remained in 1932.

Selectively logged areas which were cut in 1930 showed 1,082.2 Ribes per acre; areas logged in the same manner in 1929 showed 340.8, a reduction of 68 percent. Since areas which were logged selectively in 1928 showed only 86.0 Ribes per acre, a reduction of 92 percent over those areas logged in 1930, it means that an additional 24 percent had been forced out during the second or third year.

Applying the same mortality rate to the 1927-28 clear cut areas would have meant that at the peak of germination in about 1930 there was an average of approximately twenty-four thousand Ribes per acre. As this is from three to four times the numbers which usually attend this type of logging, it is highly improbable that such mortality occurred. In this event it appears that there was some factor present on the selectively logged areas which was inhibitory to the continued survival of the Ribes seedlings but which was partly or wholly absent from the clear cut areas. Since the only point wherein the two types of areas seemed to differ was the presence of from two to three times more residual trees on the selectively logged areas than on the clear cut, it was concluded that within certain limits the presence of a substantial tree canopy tended to regulate the extent of Ribes seedling survival. Later studies have served to substantiate this conclusion.

3. White pine reproduction. Granted the desirability of logging an area in such a manner as to prevent an excessive crop of Ribes there remained to be considered the soundness of such a practice from the standpoint of good white pine management. While such is decidedly beyond the scope and intent of the present studies some preliminary observations were made on the areas in question with respect to the apparent effects of cutting methods on white pine seeding and stocking.

Considering first the selectively logged areas it was found that those which were logged and burned in 1930 showed a white pine count per acre of 268.4; those logged in 1929 a count of 657.0; while areas which were logged in 1928 supported an average of 1,137.8. Thus it appears that each succeeding year following logging there was a substantial increase in white pine reproduction. To what extent this obtained on areas which had been clear cut was brought out when the averages for these areas were determined. It was found that during the four years which had elapsed since cutting and burning, only 341.8 white pine seedlings per acre had resulted. This is less than one-third the number that had resulted on the selectively logged areas in the same length of time.

Although the figures for white pine reproduction are significant when calculated in terms of numbers per acre, the picture is imperfectly drawn unless

On the selectively logged areas which were commercially to the clear cut areas in the time of logging and harvest, only 8% of fibre remained in 1968.

Selectively logged areas which were cut in 1967 stored 7,000.3 fibre cubic acre; areas logged in the same manner in 1968 stored 700.4, per cent. Since areas which were logged selectively in 1968 stored only 7.4 fibre per acre, a reduction of 53 percent over those areas logged in 1967, that an additional 24 percent had been forced out during the second or third year.

Applying the same mortality rate to the 1967-68 clear cut areas that at the peak of production in about 1965 there were approximately twenty-four thousand fibre per acre. As this is from three to four times the number which actually exist this type of logging, it is highly improbable that such mortality occurred. In this event it appears that there some factor present on the selectively logged areas which is contributing to the continued survival of the fibre resulting in the fibre stored on these areas from the clear cut areas. Since the only point where the two types of areas seemed to differ was the presence of fibre on the clear cut, it was concluded that with on the selectively logged areas than on the clear cut, it was considered that with this conclusion.

3. While area logging, because the desirability of logging an area in such a manner as to prevent or minimize any of fibre there should be given wherever the economics of such a practice fibre for physiologic legal value the management. While such is basically known the logic and intent of the general practices were taken on the basis of the best available information in response to the apparent efforts of cutting methods on storm damage and stocking.

Considering first the selectively logged areas in which were logged and burned in 1967 a count of 967.0 white spruce there logged in 1968 a count of 967.0. This is considered adequate an average of 1,157.3. This is because the fibre per acre following them was a substantial increase in this area. The whole subject this method is open which had been used for the average for the area were removed. It was found that fibre per acre had reduced. This is less than one-third the number on the selectively logged areas in the same length of time.

Although the figure [illegible] evaluated in terms of numbers per acre, the picture is somewhat [illegible]

the actual distribution of such is shown. For this reason the degree of stocking of the white pine reproduction on these same areas was determined. This was done by designating each milacre which contained at least one white pine seedling as being stocked. The degree of stocking for the entire area was then expressed in percentages of the milacres stocked. Counts made in this manner on the selectively logged areas showed that two years after logging 20.4 percent of the milacres contained one or more seedlings; three years after logging 34.3 percent of the milacres were stocked; while at the end of four years the number had increased to 40.0 percent. At the same time the clear cut areas, four years after logging, showed only 14.1 percent stocking.

Thus it appears that a type of selective logging such as was practiced on the areas under consideration was not inhibitory to a fair degree of natural reseeding by white pine.

B. Results of Studies Conducted During 1933.

Even though the results of the previous year's survey seemed to permit of rather definite conclusions it was deemed advisable to continue the same studies on a more extensive scale, embracing a wider range of conditions and including a much greater acreage. Accordingly, almost 10,000 additional acres of cut-over lands were traversed in 1933. Approximately the same methods of procedure were employed as during the previous season.

The new areas represented cuttings made from 1928 to 1932 inclusive, and included practically every type of treatment to which an area could be subjected.

After assembling the field data it was found that for all the areas surveyed four very definite groups or categories could be set up for comparison. These groups are fully explained and described in the annual report for 1933, pages 15-19. For reference they will be briefly outlined here:

Group I. Included 13 separate areas with an aggregate of 3,239.13 acres clear cut or partial cut, but with the brush not burned.

Group II. Included 10 separate areas with an aggregate of 1,909.09 acres. Practically all had been partially cut followed by brush disposal by piling and burning.

Group III. Included 14 areas aggregating 2,210.28 acres clear cut followed by a medium to light broadcast burn which had not completely destroyed the duff and humus down to mineral soil.

Group IV. Included 7 areas with an aggregate of 2,106.04 acres, clear cut followed by a heavy broadcast burn which had consumed most of the duff and humus, and practically all of the few residual trees which had survived the cutting.

1. Ribes seed germination. In general, the results corroborated the findings of the previous season as well as earlier investigations. The type of logging and subsequent brush disposal showed a direct effect upon the numbers of Ribes which followed. Group I showed by far the lowest numbers, followed by Group II, IV and III in the order named. Group I showed an average of [illegible] Ribes

per acre with Group II having from three to five times as many. The treatment accorded Group III resulted in the appearance of about 13 times as many as Group II and more than 37 times as many as Group I. In the case of Group IV where logging was followed by a much heavier broadcast burning than in Group III the numbers of Ribes were less than one sixth as great as in Group III but much greater than Groups I or II.

2. Ribes survival. The results for Ribes survival were made more significant when the areas were considered according to the dates of logging and burning. Considering Group I which was comprised of areas which were logged in 1928, 1929 and 1930 respectively, the numbers of Ribes per acre which remained on the areas in 1933 were 64, 62 and 204 in the order named. Since logging had been carried on in practically the same manner on all of the areas, the lower numbers of Ribes which were present on the two former groups of areas can perhaps be explained only on the basis that conditions were unfavorable for continued survival. A glance at the number of residual trees remaining on these areas after logging indicates that the shade factor played a part since on none of the areas did the number of residual trees fall far below 200 per acre.

Group II which apparently differed from Group I only in the fact that the brush was burned following the logging operations, did not display such pronounced effects when considered from the standpoint of Ribes survival.

This was probably due to the fact that in the areas which were logged earlier a much heavier cut was made. This resulted in a decidedly lighter residual stand so that in those areas which had been logged for the longer periods of time the Ribes were as numerous as in the areas which had been more recently logged but which supported almost twice the number of residual trees.

The remaining two groups of areas may be considered as somewhat comparable since the only point of difference between them was the relative intensity of the burn which followed the removal of the timber. The basis for assigning the separate areas to their respective groups was arrived at after a thorough examination of each milacre plot. If on the milacre and in the immediate vicinity of such, the organic mantle had been consumed down to the mineral soil and the majority of the residual trees had been killed by the fire, the plot was assigned to Group IV. On the other hand, if the milacre showed only a partial destruction of the forest carpet with few of the residual trees having been killed by fire, such milacre was placed in Group III. Thus an area included under Group III would not necessarily consist of a number of milacre plots all adjacent to each other and having the same degree of burn since a certain percentage of the milacres lying in the same general region might show the results of a heavy burn and be assigned to Group IV.

On comparing the areas making up Group III which had been logged and burned during successive years there was no evidence that there had occurred a progressive dying out of the Ribes after the first year following germination. While the average for each of the areas was well over 8,000 per acre, the areas which had been logged for the longest period showed as many Ribes as did the more recently logged ones. This was to be expected since very few of the areas showed a per acre residual tree count of more than 50 or 60 trees.

showed a per acre residual tree count of more than 50 or 60 trees.

While the average for each of the areas was well over 8,000 per acre, the areas which had been logged for the longest period showed as many Ribes as did the progressive dying out of the Ribes after the first year following germinational burning. Considering Group I which was composed of areas which were logged in 1928, 1929 and 1930 respectively, the numbers of Ribes per acre which the areas in 1928 were 84, 62 and 204 in the order named. Ribes logging had been carried on in practically the same manner on all of the areas, the lower numbers of Ribes which were present on the 1928 logged area can perhaps be explained only on the basis of [illegible] A glance at the counts of residual trees on the areas did not indicates that the shade factor played a part since on more of the areas did the number of residual trees fall far below 200 per acre.

Group II which apparently differed from Group I only in the fact that the brush was burned following the logging operations, showed [illegible] removal effects over [illegible] the abundance of Ribes survival.

This was probably due to the fact that in the areas which were logged [illegible] a much heavier cut was made. This resulted in a decidedly lighter residual stand so that in these areas which had been logged the longer periods of time the Ribis were in competition on [illegible] logged but which supported [illegible] the number of residual trees.

The remaining two groups of areas may be considered as somewhat comparable since the only [illegible] of the burn which followed the removal of the timber. The basis for assigning the separate areas to their respective groups was arrived at after a thorough examination of each [illegible]. [illegible] ity of brush, the organic mantle had been consumed down to the mineral soil and the majority of the residual trees had been killed by [illegible]. The [illegible] signed to Group IV. On the other hand, if the mantle showed only a partial destruction of the forest carpet with few of the residual trees having been killed by fire, such miltare was placed in Group III. Thus an area included under Group III would not necessarily consist of a number of milnore plots all adjacent to each other and having the same degree of burn since a certain percentage of the milacres lying in the same general region might show the results of a heavy burn and be assigned to Group IV.

On comparing the [illegible] burned [illegible] showed a per acre residual tree count of more than 50 or 60 trees. While the average for each of the areas was well over 8,000 per acre, the areas which had been logged for the longest period showed as many Ribes as did the progressive dying out of the Ribes after the first year following germinational burning. Considering Group I which was composed of areas which were logged in 1928, 1929 and 1930 respectively, the numbers of Ribes per acre which the areas in 1928 were 84, 62 and 204 in the order named. Ribes logging had been carried on in practically the same manner on all of the areas, the lower numbers of Ribes which were present on the 1928 logged area can perhaps be explained only on the basis of [illegible] A glance at the counts of residual trees on the areas did not indicates that the shade factor played a part since on more of the areas did the number of residual trees fall far below 200 per acre.

Group II which apparently differed from Group I only in the fact that the brush was burned following the logging operations, showed [illegible] removal effects over [illegible] the abundance of Ribes survival.

This was probably due to the fact that in the areas which were logged [illegible] a much heavier cut was made. This resulted in a decidedly lighter residual stand so that in these areas which had been logged the longer periods of time the Ribis were in competition on [illegible] logged but which supported [illegible] the number of residual trees.

The remaining two groups of areas may be considered as somewhat comparable since the only [illegible] of the burn which followed the removal of the timber. The basis for assigning the separate areas to their respective groups was arrived at after a thorough examination of each [illegible]. [illegible] ity of brush, the organic mantle had been consumed down to the mineral soil and the majority of the residual trees had been killed by [illegible]. The [illegible] signed to Group IV. On the other hand, if the mantle showed only a partial destruction of the forest carpet with few of the residual trees having been killed by fire, such miltare was placed in Group III. Thus an area included under Group III would not necessarily consist of a number of milnore plots all adjacent to each other and having the same degree of burn since a certain percentage of the milacres lying in the same general region might show the results of a heavy burn and be assigned to Group IV.

On comparing the [illegible] burned [illegible] showed a per acre residual tree count of more than 50 or 60 trees. While the average for each of the areas was well over 8,000 per acre, the areas which had been logged for the longest period showed as many Ribes as did the progressive dying out of the Ribes after the first year following germinational burning. Considering Group I which was composed of areas which were logged in 1928, 1929 and 1930 respectively, the numbers of Ribes per acre which the areas in 1928 were 84, 62 and 204 in the order named. Ribes logging had been carried on in practically the same manner on all of the areas, the lower numbers of Ribes which were present on the 1928 logged area can perhaps be explained only on the basis of [illegible] A glance at the counts of residual trees on the areas did not indicates that the shade factor played a part since on more of the areas did the number of residual trees fall far below 200 per acre.

Group II which apparently differed from Group I only in the fact that the brush was burned following the logging operations, showed [illegible] removal effects over [illegible] the abundance of Ribes survival.

This was probably due to the fact that in the areas which were logged [illegible] a much heavier cut was made. This resulted in a decidedly lighter residual stand so that in these areas which had been logged the longer periods of time the Ribis were in competition on [illegible] logged but which supported [illegible] the number of residual trees.

The remaining two groups of areas may be considered as somewhat comparable since the only [illegible] of the burn which followed the removal of the timber. The basis for assigning the separate areas to their respective groups was arrived at after a thorough examination of each [illegible]. [illegible] ity of brush, the organic mantle had been consumed down to the mineral soil and the majority of the residual trees had been killed by [illegible]. The [illegible] signed to Group IV. On the other hand, if the mantle showed only a partial destruction of the forest carpet with few of the residual trees having been killed by fire, such miltare was placed in Group III. Thus an area included under Group III would not necessarily consist of a number of milnore plots all adjacent to each other and having the same degree of burn since a certain percentage of the milacres lying in the same general region might show the results of a heavy burn and be assigned to Group IV.

The results for Group IV, on which the fire had been heavy enough to destroy practically all the organic mantle, revealed a not much greater Ribes problem than Group II, for the general average was 1,376 Ribes plants per acre, not quite twice as many as for Group II. There was no evidence to show any marked dropping out of the Ribes seedlings so that the comparatively low numbers found in all the areas pointed to a paucity of viable seeds rather than to a later forcing out of the resulting seedlings. Since the residual tree count for these areas was in all cases less than 20 trees per acre, no shade factor could have been responsible.

An interesting point was brought out in the consideration of Group IV which was, that on areas which had been heavily burned there was a point beyond which the numbers of the subsequent Ribes population were inversely proportional to the intensity of the burn. Such information might prove to be of practical importance for it is conceivable that on certain areas circumstances might be such that the complete removal of the forest cover, followed with a very heavy burn, might be the most feasible and economical method of disposing of the Ribes problem. Such areas could then be planted.

3. White pine reproduction. Preliminary to a consideration of the relative effects of the various types of logging and burning encountered during 1933 on the natural reseeding and restocking of the sites by white pine, it must be stated that unlike the areas dealt with in 1932, no effort had been made to administer any of the stands on a selective basis. On some of the areas, especially in Groups I and II, subsequent to 1930 a type of so-called selective cutting had been practiced, but selective only in the sense that only white pine and cedar were selected for cutting. Certainly no white pine seed trees were left as such and reseeding of the area by white pine was necessarily dependent upon chance trees considered unfit for lumber left on the area, and from trees outside the area. As a result of such type of logging a preponderance of residual trees of the so-called inferior species resulted. In spite of this the areas showed a rather surprising amount of white pine reproduction when compared with the other species.

The greatest numbers of white pine reproduction appeared on areas on which the brush had been piled and burned. Only one half as many were found on the areas where no burning occurred. Satisfactory reseeding had begun in all the groups however, the lowest number, 187.3 seedlings per acre occurring on the areas which had been heavily burned.

C. Discussion.

Considering as a whole the results of the studies conducted during the past three years it appears that not only can the germination of the Ribes seeds, which underlie our upland white pine stands be controlled, but the extent of survival of the resulting seedlings can also be regulated. The question of the worth of such information to the forester appears to depend not so much upon the efficiency of the methods themselves as in their applicability to silvicultural methods. It is obvious that in dealing with a problem which has for its aim the protection and conservation of the white pine, no plan should be considered which would not reasonably concur with the best management plans as developed for this tree species. On the other hand as has been stated by someone, "some of the best possibilities of tree disease prevention undoubtedly lie in special adaptations

found in all the areas pointed to a paucity of viable seeds rather than to a later forcing rot of the seedlings already. Since the seedlings over most of these areas was in all cases less than 20 trees per acre, we doubt fire would have been responsible.

An interesting point was brought out in the explanation of Group II which was, that on areas which had been heavily burned there was a paucity beyond which the numbers of the subsequent three months were increasingly economical to the intensity of the burn. Such information might be of practical importance for it is conceivable that on certain areas alternatives might be such that the complete removal of the forest cover, followed with a very heavy burn, might be the most feasible and reasonable method of disposal of the fire problem. Such areas could then be planted.

7. White pine reproduction. Preliminary to a consideration of the relative effects of the various types of logging and burning encountered during 1931 on the natural reseeding and restocking of the cut-over areas, it must be stated that unlike the areas dealt with in 1930, no effort had been made to eliminate any of the stands on a subjective basis. On some of the areas, especially in Groups I and II, subsequent to 1930 a type of so-called selective cutting had been practiced, but selective only in the sense that only mature and decadent trees were selected for cutting. Certainly in many cases these were left as good and reserved of the area by white pine were scarcely impressed upon the areas considered until the lumber left on the area, and from there on the slash. As a result of such type of logging a tremendous quantity of residual trees of the so-called inferior species remained. In spite of this fact there existed rather surprising amount of white pine reproduction when compared with the other species.

The greatest number of white pine reproduction occurred on areas on which the brush had been piled and burned. Only one half as many trees found on the area where no burning occurred. Scarcely one half as many trees per acre were found on areas which had been heavily burned.

8. Discussion.

Considering as a whole the results of the study conducted during the past three years it appears that not only can the prediction of the future crop which might safely also always be considered, but the amount of survival of the resulting seedlings can also be predicted. The question of the worth of such information to the forest manager is based not on final mean efficiency of the various fire-cuts as in their specificity as silvicultural methods. It is obvious that in dealing with a virgin white pine forest, protection and conservation of the white pine should be considered as an tree species. On the other hand if the white pine has been cut, "some of the best possibilities of tree to secure reproduction naturally like in mixed white

of forest management," and "in extreme cases pathological requirements may dominate silvicultural measures." Thus it is thinkable that under certain conditions and in some situations slight departures from the regular prescribed management practices might be made in such a way as not to prove too detrimental to the welfare of the white pine while at the same time maintaining conditions which are inhibitory to Ribes. That a promising start has been made in this direction, seems probable when one considers the areas studied in 1932. Here is a block of timber approximating 200,000 acres in extent, which, if the beginning already made can be used as an index, apparently can be administered in a manner which will insure a sustained yield of white pine, and in which nature can be depended upon to rid the areas of a large proportion of the Ribes before the intervention of the eradication forces is necessary. In contrasting areas such as these in which the peak of the Ribes count seldom exceeded 1,500 plants per acre, with areas which had been administered differently and on which the Ribes count sometimes reached a total of 15,000 to 20,000 per acre, the possibilities for Ribes control by means of cutting methods seem hopeful.

Though it is true that the areas in which the most favorable results were obtained represented optimum conditions for white pine, and lent themselves most readily to that particular type of management, while other areas, not so favored, could not possibly be so administered, other methods just as effective might be devised. In any event, it seems clear that no one method can ever be relied upon to meet the situation under all circumstances. Enough information is at hand, however, to warrant further investigations along this line, not with the vain hope of solving the upland Ribes problem by management methods alone, but merely with the hope of supplementing and augmenting the practices already existent.

D. Summary.

1. A survey has been conducted on approximately 11,000 acres of cut-over lands in the white pine region of northern Idaho with the idea of determining the effects of various logging and burning methods on the upland Ribes population.

2. Logging on a selective basis, such as practiced by the Potlatch Lumber Company on their Clearwater holdings appeared to be the most satisfactory method when considered from the standpoint of both Ribes and white pine reproduction.

3. The numbers of Ribes which appeared following a logging operation were proportional to the degree of disturbance to which the forest floor was subjected.

4. Burning appeared to be the most important agency in the bringing in of Ribes since areas which had been logged and on which the brush was not burned supported from one-third to one-fortieth the number of Ribes which were found on areas which had been burned.

5. Areas on which brush disposal was carried on by piling and burning showed about a 30 percent increase in numbers of Ribes over areas on which the brush had not been burned.

6. Where timber had been clear cut followed by broadcast burning, provided the burn was not sufficiently intense to destroy almost completely the organic mantle, the greatest numbers of Ribes followed. On areas treated in this manner,

of cutting methods seem hopeful.

Though it is true that the areas in which the most favorable results were obtained represented optimum conditions for white pine, and that results vastly to that particular type of management, while other types, not to control could not profitably be so manipulated, other methods, later or elsewhere might be devised. In any event, it seems clear that no one method can ever be relied upon to meet the situation under all circumstances. Through intensive study, however, in various localities and by experiment along various lines, we may eventually find the right method for each particular situation. Even with the hope of successfully solving the problem by management methods, the possibility of failure must always be considered.

D. Summary.

1. A survey has been completed on approximately 11,000 acres of cut-over lands in the white pine region of northern Idaho with the idea of determining the effects of various logging and burning methods on the natural fire problem.

2. Logging on a selective basis, such as practiced by the Potlatch Lumber Company on their Clearwater holdings, results in a highly inflammable condition when considered from the standpoint of cost, since each unit area produces.

3. The numbers of fires which occurred following logging operations were proportional to the degree of disturbance to which the forest floor was subjected.

4. Burning appears to be the most important aspect in the bringing in of fires since areas which had been logged and on which the brush was not burned reported from one-third to one-fortieth the number of fires which were found on areas which had been burned.

5. Areas on which brush disposal was carried on by cutting and burning showed about a 50 percent increase in numbers of fires over areas on which the brush had not been burned.

6. Where timber had been clear cut followed by broadcast burning, practically the burn was sufficiently complete to destroy almost completely the organic debris, the greatest number of fires followed. In areas logged in this manner

as many as 15,000 to 20,000 Ribes per acre resulted.

7. Areas on which the broadcast burn had almost completely consumed the duff and humus, showed a Ribes count not far in excess of those areas on which the brush had been piled and burned.

8. The amount of canopy which was allowed to remain on an area appeared to play a prominent role in the survival of Ribes seedlings, since areas on which a certain degree of shade remained showed fewer Ribes three and four years after logging and burning than did areas on which the residual trees were fewer in number. The degree of shade necessary to force out the Ribes did not appear to be inhibitory to successful establishment of white pine reproduction.

II. INFLUENCE OF VARIOUS TYPES OF MANAGEMENT ON RIBES SEED GERMINATION AND SEEDLING SURVIVAL

In addition to the studies which had been conducted relative to the effects of ordinary commercial logging methods on the upland Ribes, a start was made on what is hoped will prove to be an extensive series of experimental studies in connection with various types of management projects as set up by the Forest Service Experiment Station.

As a part of its expansion program, the Northern Rocky Mountain Experiment Station is establishing the Deception Creek Experimental Forest on the Coeur d'Alene National Forest. Here are to be conducted extensive experimental projects involving various management plans for white pine. It is planned to conduct Ribes ecology studies concurrently with the management experiments, applying insofar as possible all the information which has thus far been obtained through past investigations. By means of such studies it may be possible to determine more accurately whether or not the upland Ribes problem can be made an integral part of white pine silviculture. Such information, while perhaps not absolutely essential to the control program in the immediate future, in view of the liklihood that the stored Ribes seed problem will be a vital one for years to come, may prove to be of inestimable worth at some future time.

Since the field work on the cutting method studies was not completed until near the end of the field season only a very preliminary beginning was made in the way of plot establishment. Two experiments were started as follows:

A. Effects of Degrees of Thinning on Ribes Seed Germination and Survival.

Purpose: This experiment was laid out with the idea of determining the effects that different degrees of thinning might have upon the germination of Ribes seed which underlie the forest carpet. Also, to follow up the survival of such resulting seedlings and observe the effects of the closing in of the canopy on the growth and development of those plants which survive.

Three quarter-acre plots, Nos. 26, 27 and 30 were selected for this study. These plots had been laid out in a very dense stand of 41-60 year old white pine and in the fall of 1933 each plot was given a different degree of thinning. The exact spacing of the trees and the basis for determining the particular degree of thinning given each plot has not yet been obtained from the

as many as 16,000 to 20,000 ribes per acre resulted.

7. Area on which the treatment was applied. Approximately two-half brush had been piled and burned.

8. The amount of energy which was allowed to remain on the area varied in that a considerable part in the control of ribes seedlings, since after a certain degree of shade developed stunted trees died there and their growth. Logging and burning then did away with the residual trees were first in number. The degree of shade necessary to force out the ribes seedlings is important to successful establishment of white pine reproduction.

II. Influence of Planting Stock on Blister Rust Infection

In addition to the studies which had been conducted relative to the effects of artificial conditions surrounding the white pine, a study was made on what is found will have to be necessarily varied of experimental planting in connection with various types of unprepared planting stock in the Forest Service Experiment Stations.

As a part of its expansion program, the Northern Rocky Mountain Experiment Station is establishing the Upper Priest Experiment Forest on the Coeur d'Alene National Forest. Here are to be combined extensive research projects involving various management plans for white pine. It is planned to conduct ribes control studies concurrently with the management experiments, supplying insofar as possible all the information which they can for their material through past investigations. By means of such studies it may be possible to determine more accurately whether or not the natural ribes crop can be made an integral part of white pine silviculture. Such information, while perhaps not absolutely essential to the control program in the immediate future, is viewed as highly desirable that the ground ribes may eventually will be a vital one for years to come, may prove to be of inestimable worth at some future time.

Since the field work on the planting method studies was not completed until near the end of the field season only a very preliminary report can be made in the way of plot establishment. The procedure were started as follows:

A. Effects of Degrees of Shading on Ribes Seedlings and Saplings.

Purpose: This experiment was laid out with the idea of determining the effects that different degrees of shading might have upon the survival of ribes seed which naturally the forest nurses. Also, to follow up the survival of such resulting seedlings and observe the effects of the shade in the forest on the growth and development of those plants which survive.

Three quarter-acre plots, Nos. 26, 27 and 30 were selected for this study. These plots had been laid out in a very dense stand of 60-70 year old white pine and in the fall of 1929 each plot was given a different degree of thinning. The exact structure of the trees and the basis for classifying the similar degree of thinning given each plot has not yet been received from the

Experiment Station records so can not be given here.

In plots 26 and 27, all debris was removed from the plots following the thinning, but on plot 30 the brush was piled and burned within the confines of the plot.

On each of these plots three continuous strips 3.3 feet across and 23.6 feet apart were run across the plots. Within these strips all Ribes were marked with a wire pin and charted on the field map. Observations will be made at definite intervals.

B. Effect of Re-disturbances on Old Cut-Over Areas.

This study was conducted on an old cut-over area which had been logged in 1917. Only white pine had been removed and a considerable number of seed trees were left. The western hemlock and white fir had been girdled but not removed. Some burning had been done and there now remained on the ground many down logs and quite a heavy brush cover of shrubby and herbaceous plants. Initial eradication had been carried on in 1927 and a rework in 1933. In both workings some Ribes viscosissimum and Ribes lacustre were removed.

It was thought that such an area should prove interesting from an ecological point of view. Since the original disturbance accompanying the logging operation had not been great and with the girdling of the hemlock and fir there had resulted a more or less gradual opening up of the canopy unaccompanied by further disturbance of the forest floor, it should be of interest to know the effect of such on the stored Ribes seeds. In other words since it is not probable that the disturbance caused by the logging operation was extensive enough to cause a general germination of the Ribes seeds at that time, did the further removal of the canopy, through girdling of the hemlock and white fir accomplish this? To determine this it was planned to redisturb the ground surface at stated places and note any resumption of germination.

This was done by laying out 15 pairs of milacre plots scattered over the area in such a way that they would be representative. The ground surface of one of each pair of milacres was thoroughly stirred down to mineral soil and all branches, mats of grass and other debris removed. This left an excellent seed bed for any seeds which might be present. The second milacre in each case was left as a check. Examination of these plots will be conducted at regular intervals. It is planned to continue studies of like nature during the season of 1935.

Experiment Station records so can not be given here.

In plots 26 and 27, all debris was removed from the plots following the planting, but on the rest of the area only enough debris to cover the plot.

On each of these plots three continuous strips 5.3 feet across and 16.4 feet apart were run across the plots. Within these strips all plants were counted with a view to ascertaining the effect of the different soil preparations on the germination.

B. Effect of Re-disturbances on Old Cut-Over Area.

This study was conducted on an old cut-over area which had been logged in 1917. Only white pine had been removed and a considerable number of seed trees were left. The western hemlock and white fir had been girdled but not removed. Some burning had been done over the ground in the past but not enough to destroy the heavy cover of debris and brushwood plants. Initial germination had been carried on in 1920 and a result in 1921. In both examples the fallen timber had not been removed.

It was thought that some of the second type disturbance would be typical trial of plots. Since the original disturbance was merely the logging operations and not very good and with the planting of the Douglas and fir there had resulted a more or less gradual covering up of the debris, especially on the lower portions of the burns. Over. It would be of interest to know the effect of such on the young seedlings. It might also allow it to get into that the disturbance caused by the logging certainly was responsible for a general germination of the other seeds at that time, but the burning removed by the heavy, brush, or the planting or the cultivation of the soil necessary for the latter, would remove this germination or germination.

This was done by laying out 15 pairs of milacre plots scattered over the area in such a way that they would be representative. The ground surface of each unit of milacre was thoroughly cleared down to mineral soil and all brushes, moss or grass and other debris removed. This left it exposed for any seeds which might be present. The second milacre in each pair was left as a check. Examination of these plots will be conducted every year.

RIBES ERADICATION, INLAND EMPIRE, 1934

By
H. E. Swanson
Agent

INTRODUCTION

The Ribes eradication program in the Inland Empire during the 1934 field season was considerably larger than any undertaken in previous years. This program included 42 Emergency Conservation Corps camps, 144 NIRA camps operated with funds made available to the Division of Plant Disease Control and the U. S. Forest Service from the NIRA allotment, and 4 cooperative camps operated with funds from the Division of Plant Disease Control and the State of Idaho. Late in the season, 400 men were employed with funds made available to the Washington Emergency Relief Administration, and 330 men with Idaho Emergency Relief Administration funds.

The work was performed on lands of the Clearwater National Forest, the Clearwater Timber Protective Association, the St. Joe National Forest, the Potlatch Timber Protective Association, the Coeur d'Alene National Forest, the Kaniksu National Forest, Priest Lake Timber Protective Association, and the Cabinet National Forest. The NIRA camps, financed by the Division of Plant Disease Control and by cooperative funds from the State of Idaho, were located on state and private lands. The NIRA camps, financed by the U. S. Forest Service, were located on federal lands.

A small operation was also conducted on the Mount Rainier National Park. The results of this work are not included in the general summaries of the work performed in the Inland Empire.

ORGANIZATION AND ADMINISTRATION

More detailed descriptions are given of the field organizations under the project reports. In general the cooperative relations between the Forest Service and the Division of Plant Disease Control were the same as in previous seasons, the former being responsible for such matters as transportation and the furnishing of supplies and equipment, the latter assuming responsibility for technical supervision of the field work. The two organizations worked together in the selection of areas to be worked and in the selection and training of the field supervisors. In regard to the Emergency Conservation Corps camps, the responsibility of the Forest Service and the Division of Plant Disease Control lay chiefly in the selection of the technical overhead for these camps and in the direction of the work in the field. The United States Army was responsible for establishing the camps on designated sites, moving their companies and taking care of supplying and maintaining them. In case spike camps were established away from the base camp, the Forest Service supplied the equipment for these camps.

An ECW camp is normally made up of 200 enrollees. For a camp engaged entirely on blister rust control work the technical supervision included a camp superintendent, seven technical foremen, a checker foreman and two checkers. In camps engaged on other work projects besides blister rust control, the number of foremen and checkers for blister rust work was reduced proportionally according to the number of enrollees assigned to this work.

INTRODUCTION

The blue stain control project in the United States during the 1942 field season was considerably larger than any undertaken in previous years. This program included a Emergency Conservation Corps camps. Two CCC camps were provided with funds made available to the Division of Plant Disease Control and the U. S. Forest Service from the CCC allotment, and a memorandum agreement with Texas was signed from the Division of Plant Disease Control and the State of Indiana. Late in the season, 400 men were employed with funds made available in the Texas Relief Administration, and 200 men with funds from Emergency Relief Administration funds.

The work was centered on lands of the Clearwater National Forest, the Clearwater Timber Protective Association, the Weyerhaeuser Timber Company, the Potlatch Timber Protective Association, the Idaho Panhandle National Forest, the Kaniksu National Forest, the Nezperce National Forest, the Coeur d'Alene National Forest, the Bitterroot National Forest. The CCC camps, financed by the Division of Plant Disease Control and cooperative funds from the State of Idaho, were located on state and private lands. The CCC camps, financed by the U. S. Forest Service, were located on federal lands.

A small operation was also conducted on the Wenatchee National Forest. The results of this work are not included in the general summaries of the work performed in the Inland Empire.

ORGANIZATION AND ADMINISTRATION

More detailed descriptions are given of the field organizations under the project reports. In general the cooperative relations between the Forest Service and the Division of Plant Disease Control were as in previous seasons, the former being responsible for work outside of incorporated and the furnishing of supplies and equipment, the latter assuming responsibility for technical supervision of the field work. The two organizations worked together in the selection of sites to be worked and in the selection and training of the foremen. In regard to the Emergency Conservation Corps camps, the responsibility of the Forest Service and the Division of Plant Disease Control lay chiefly in the selection of the technical overhead for these camps and in the direction of the work in the field. The United States Army was responsible for establishing the camps on designated sites, during short campaigns and during parts of supplying and maintaining them. In some cases camps were maintained away from the base camp, the Forest Service supplied the equipment for these camps.

An EOW camp is normally made up of 200 enrollees. For a camp engaged entirely on blister rust control work the technical supervision included a camp superintendent, seven technicians (foremen, a chauffeur-truck driver, and a cook), and camps engaged on other work projects besides blister rust control, the number of foremen and chauffeurs for blister rust work was reduced proportionally according to the number of enrollees assigned to this work.

A regular NIRA camp included 31 men: a camp foreman, cook, second cook, flunky, 9 crew leaders and 18 laborers. A crew leader and two laborers constituted a crew. One checker performed the checking work in two of these camps.

Clarence C. Strong of the Division of Plant Disease Control was responsible for the general technical supervision of the Ribes eradication program in the Inland Empire. He served in this capacity until the close of the season at which time he accepted a position with the United States Forest Service at Missoula. His duties at that time were taken over by Herman E. Swanson.

The assignment of full time personnel of the Division of Plant Disease Control on Ribes eradication was as follows:

General supervision - Inland Empire:
C. C. Strong - Project leader in charge of local control.
H. E. Swanson - Project leader in charge of checking and Ribes Eradication Methods.

Clearwater Project:
B. A. Anderson - Operation supervisor
F. J. Heinrich - Assistant operation supervisor
H. J. Faulkner - Checking supervisor

St.Joe Project:
H. J. Hartman - Operation supervisor
M. C. Riley - Assistant operation supervisor
D. F. Williams - Unit supervisor
S. E. McLaughlin - Unit supervisor
W. F. Painter - Checking supervisor

Coeur d'Alene Project:
W. G. Guernsey - Operation supervisor
N. D. Nelson - Assistant operation supervisor
M. D. Oaks - Unit supervisor
A. L. Pence - Checking supervisor

Kaniksu Project:
F. O. Walters - Operation supervisor
L. L. White - Assistant operation supervisor
H. A. Brischle - Checking supervisor

Cabinet Project:
C. H. Johnson - Operation supervisor

Mount Rainier National Park
H. F. Geil - Unit supervisor

Experimental Work:
Chemical Eradication Methods - St.Joe National Forest
V. D. Moss - Assistant in methods
Bulldozer Operations: Coeur d'Alene National Forest, Kaniksu National Forest
J. F. Breakey - Unit supervisor

A regular WPA camp included 21 men: a camp foreman, cook, second cook, clerk, 2 crew leaders and 15 laborers. Larger camps had two leaders and two laborers each- tuted a crew. One checker performed the checking work in two of these camps,

Clarence O. Strong of the Division of Plant Disease Control was responsible for the general technical supervision of the Yukon eradication program in the Yukon Basins. He served in this capacity until the close of the season at which time he accepted a position with the United States Forest Service at Klamath Falls as that time were taken over by Steven E. Emmons.

The assignments of full time personnel of the Division of Plant Disease Control on Bikes eradication was as follows:

General supervision - Yukon Region:
O. C. Strong - Project leader in charge of local control.
E. E. Emmons - Project leader in charge of eradicating cud bikes
Eradication Methods.

Clearwater Project:
B. A. Anderson - Operation supervisor
E. J. Eskerson - Assistant operation supervisor
H. J. Kaufmer - Checking supervisor

St.Joe Project:
H. J. Hartman - Operation supervisor
M. O. Athey - Assistant operation supervisor
D. R. Williams - Unit supervisor
S. E. McLaughlin - Unit supervisor
W. F. Painter - Checking supervisor

Coeur d'Alene Project:
W. J. Guernsey - Operation supervisor
E. J. [illegible] - Assistant operation supervisor
M. O. Cate - Unit supervisor
E. E. Pope - Checking supervisor

Kaniksu Project:
R. O. Walters - Operation supervisor
I. L. Kyle - Assistant operation supervisor
H. A. Briscoe - Checking supervisor

Cabinet Project:
C. E. Johnson - Operation supervisor

Mount Rainier National Park
H. N. Gill - Unit supervisor

Experimental Work:
Chemical Eradication Methods - F. F. Baldwin, Jr.
T. E. Moss - Assistant in charge
Fallcrop Investigations: Coeur d'Alene National Forest.
Seminar material taken
J. N. Breakey - Unit supervisor

The number of camps and men comprising the Ribes eradication program is shown in the following list:

Activity	Number of Camps	Number of Men
ECW	42	6,204
NIRA*	148	4,882
Total	190	11,086

*1,248 men were employed in 39 NIRA camps financed by the Division of Plant Disease Control and 3,634 men were employed in 111 NIRA camps financed by the U. S. Forest Service.

The number of men comprising the checking organization is shown in the following list:

Activity	Checker Foremen	Checkers	Total Number of Men
ECW	41	87	128
NIRA	17	88	105
Total	58	175	233*

*This number is included in the total for the Ribes eradication program.

In addition to the camps listed above, two ECW camps were engaged in blister rust work on Mount Rainier National Park. An average number of 35 men was used for each camp, with a foreman in charge of each group. A man employed by the Division of Plant Disease Control directed the work of both crews.

METHODS AND EQUIPMENT

The methods employed on Ribes eradication were in general the same as those used during the 1933 field season. However certain changes were made to improve the work.

1. Considerable effort was made to train eradication crews to cover the proper width of strip. In past years crews tended to take too narrow strips. Except under very adverse conditions a man can cover at least 6 feet of ground on both sides of him. This would make a minimum width of 12 feet per man or 36 feet for a 3-man crew. During the 1933 field season the majority of crew strips were much less than this in width even in cases where they should have been wider than 36 feet. The stressing of this point in training schools and the close supervision given to crews throughout the summer resulted in their working strips as wide as could safely be taken and still maintain as high a degree of efficiency in finding Ribes as was done before.

2. In connection with chemical eradication of Ribes, 1½ pounds of Atlacide per gallon of water had been used. Acting upon the recommendations of the chemical investigative unit this amount of chemical per gallon of water was reduced to one pound. The basis for this change was the thorough drenching that crews were giving the Ribes. More satisfactory results are obtained from this lighter concentration of chemical applied to all parts of the bush, including an application to the root crown, than can be obtained with a heavier concentration of chemical applied less thoroughly.

3. In the matter of maps and records, much progress was made in simplifying and systematizing this phase of the work. Maps were prepared showing the time required to work small units of area (from 40 to 80 acres in extent) and the number of Ribes eradicated from each unit. Checking maps were prepared showing the number, size and location of missed Ribes. With these two records it will be possible to determine what additional work may be needed on the area. It will eliminate further inspection and unnecessary reworking of areas which were either originally free of Ribes or on which Ribes have been completely eradicated. By the systematic and gradual elimination of these small areas from the rework program, future work will be confined to places where it is actually needed. Under this procedure, the entire control area will be placed on a maintenance basis at a minimum cost.

4. Two bulldozers were put in the field, one on the Coeur d'Alene National Forest and one on the Kaniksu unit. These machines were very successful in clearing brush and Ribes from stream type areas that could not be satisfactorily handled by hand pulling or spraying methods.

5. On account of the larger operation in 1934 and the greater number of men experienced in the work to assist in training, training schools were conducted on each operation. This permitted the giving of more attention to the individual man and training him along lines closely associated with conditions he would encounter on his particular area.

CHECKING

A checking organization acting independently of the Ribes eradication unit checked the efficiency of the work. While the organization was set up as a separate unit it cooperated to the fullest extent with the eradication forces to facilitate the progress of eradication and to insure satisfactory work.

Areas were checked in advance of crew work to eliminate unnecessary working of areas which were free of Ribes. In the checking of areas following crew work, the location of missed Ribes was spotted on a map. The distribution pattern resulting from plotting these missed Ribes made it possible to go back and rework particular patches of ground on which more than 25 feet of Ribes live stem were left per acre.

Areas were checked by running parallel strips at intervals of 5-chains. By taking a strip 13.2 feet in width 4 percent of the area was checked. In stream type a higher percentage of the area was checked. In the wide stream bottoms an 8 percent check was made by running parallel strips at 2½-chain intervals, while smaller tributaries, referred to as upland streams, were checked by following out their entire course. In the latter case the check approached a 100 percent rework of the streams, since the checkers pulled all bushes which were found.

In the course of their work checkers were forced into many long days in order to keep pace with the eradication work. This was especially true in case of the checkers in NIRA camps. At such times that no areas were available for checking, the checkers assisted the eradication forces by assisting the camp boss

in making preliminary surveys of areas yet to be worked, by supervising crew work and by directing necessary rework.

PREERADICATION SURVEY

At the close of the Ribes eradication season a party was organized on each operation to complete the survey of those areas on which survey work had not been done in previous years. The intensiveness of this survey on each operation was governed by the amount of area yet to be covered. On those operations having a relatively small amount of ground to cover, the area was surveyed by the strip method. However, in the case of the St.Joe, the Kaniksu and Pend Oreille, and the Kootenai and Cabinet units so much area remained to be covered that the scouting method was used. This season marked the practical completion of this type of survey making it possible to determine with a high degree of accuracy those areas warranting protection from blister rust, and also to make a reasonably close estimate on the amount of work involved to establish control. In the future any post-season surveys which are made will be of a more intensive nature to locate definitely the boundaries of areas to be worked, and also to perform some of the necessary work which hitherto has been done in the spring preparatory to starting the eradication work. This will facilitate the starting of the spring work.

INDIVIDUAL PROJECT REPORTS

Detailed reports on Ribes eradication are presented by states as indicated.

Montana:

1. Cabinet Project.

Idaho:

1. Chemical Eradication Methods
2. Ribes Eradication by the Bulldozer Method
3. Ribes Eradication - Clearwater Project
4. Ribes Eradication - St.Joe Project
5. Ribes Eradication - Coeur d'Alene Project
6. Ribes Eradication - Kaniksu Project

Note: The report on the Kaniksu Project includes work done in Idaho and work on adjacent lands in Washington.

Washington:

1. Ribes Eradication - Mount Rainier National Park.

STATEMENT OF EXPENDITURES AND COSTS

The following tables represent a summary of expenditures and costs for the Clearwater Project, St.Joe Project, Coeur d'Alene Project, Kaniksu Project and Cabinet Project. These tables include funds expended from NIRA allotments to the U. S. Forest Service and to the Bureau of Entomology and Plant Quarantine in addition to funds disbursed from regular appropriations allotted to these organizations. They also include funds contributed by cooperating agencies.

No costs are available for ECW work except those incurred by the U. S. Forest Service and the Bureau of Entomology and Plant Quarantine in the course of providing technical supervision to ECW work. These expenses were paid from NIRA funds and are shown in Table No. 2 under "Cooperation with ECW".

in making preliminary surveys of areas yet to be reached by aeroplane and by directing necessary rework.

[illegible]

At the close of the Ribes eradication season a party was organized on each operation to complete the survey of about [illegible] work originally [illegible] been done by private parties. The [illegible] of this survey was governed by the amount of time yet to be [illegible]. The [illegible] method] is relatively small amount of rework to [illegible]. The area was covered by [illegible] method. However, in the [illegible], the Kaniksu and Coeur d'Alene Forests and cruisers units so much more thorough is to be covered this type of method was used. This season marked the practical completion of this type of survey making it possible to [illegible] with a high degree of accuracy warranting progress from [illegible]. We also to make a responsibility statements on the amount of work involved in maintaining control. In the future the season surveys which are made will be of a more intensive nature to locate definitely the boundaries of areas to be worked, and also to perform some of the necessary work which hitherto has been done in the regular procedure to complete eradication work. This will facilitate the starting of the spring crews.

[illegible]

Detailed reports on Ribes eradication are presented by states as indicated.

Montana:
1. Cabinet Project.

Idaho:
1. [illegible]
2. Ribes Eradication by the Bulldozer Method
3. [illegible]
4. Ribes Eradication - St. Joe Project
5. [illegible]
6. Ribes Eradication - Kaniksu Project

Note: The report on the Kaniksu Project includes work done in Idaho and work on adjacent lands in Washington.

Washington:
1. Ribes Eradication - Mount Rainier National Park.

[illegible]

The following tables represent a summary of expenditures and costs for the Cleanwater Project, Clearwater, Coeur d'Alene, Cabinet Project, Clearwater Project. These tables [illegible] expended [illegible] to the U. S. Forest Service and the Bureau of Entomology and Plant Quarantine in the course of [illegible] tion to funds disbursed from regular appropriations allotted to these organizations. They also include [illegible].

No costs are available for NCW work except those incurred by the U. S. Forest Service and the Bureau of Entomology and Plant Quarantine in the course of [illegible] and are shown in Table No. 2 under "Cooperation with NCW".

TABLE NO. 1

EXPENDITURES BY APPROPRIATIONS, 1934
INLAND EMPIRE

Cooperating Agency	Appropriation	Amount
Forest Service	Impnira	$1,451,704.81
	Lieunira	128,308.23
	S & E - R 1	1,166.80
	ECW	772.76
	Other	1,012.39
	Total	1,582,964.99
Bureau of Entomology and Plant Quarantine	Regular (B.P.I.) Idaho	7,797.32
	Regular (B.P.I.) Wash.	668.52
	Regular (B.P.I.) Mont.	3,286.37
	Nira - Idaho	240,583.22
	Nira - Wash.	76,511.55
	Nira - Montana	65,102.42
	Total	393,949.40
Other Cooperative Funds	IERA	15,785.14
	WERA	19,743.41
	State of Idaho	29,154.06
	Total	64,682.61
Total Expenditures		$2,041,597.00

TABLE NO. 2

CLASSIFIED EXPENDITURES, 1934
INLAND EMPIRE

Item	NIRA	Cooperative and ECW	Total
Salaries, Permanent Men	$ 45,875.06	$ 17,815.15	$ 63,690.21
Wages, Temporary Men	1,415,449.68	14,659.53	1,430,109.21
Subsistence Supplies	234,764.93	3,200.00	237,964.93
Equipment	148,835.16	4,292.25	153,127.41
Other Supplies	67,320.34		67,320.34
Transportation and Travel	86,724.75	2,660.15	89,384.90
Total Expenditures	1,998,969.92	42,627.08	2,041,597.00
Less 2/3 Cost of New Equipment	101,442.80		101,442.80
Less Cost of Unused Supplies	7,144.81		7,144.81
Less Cost 1934 Preeradication (Kootenai)	902.74		902.74
Plus 1/3 Cost of Old Equipment	16,793.70		16,793.70
Plus Cost of Supplies on Hand	1,672.02		1,672.02
Plus 1933 Preeradication	2,989.33		2,989.33
Plus Bulldozer Depreciation	1,357.00		1,357.00
Net Cost 1934 Operation	$1,912,291.62	$ 42,627.08	$1,954,918.70

Additional Cost Information:

1. Effective man-day cost - NIRA $ 7.923
2. Food cost per man day - NIRA .4995
3. Pounds of Atlacide used, NIRA and ECW, 560,500 Cost $40,878.06
4. Pounds of twine used, NIRA and ECW 103,278 Cost $30,423.40

RESULTS OF RIBES ERADICATION IN INLAND EMPIRE

The following tables represent a summary of the work performed on the Clearwater Project, St. Joe Project, Coeur d'Alene Project, Kaniksu Project, and Cabinet Project:

Item		Cooperative	Total
Subsistence Supplies	254,764.93	5,000.00	259,764.93
Equipment	148,855.16	4,352.85	153,208.01

Additional Cost Information:

1. Effective man-day cost - NIMA $ 7.923
2. Food cost per man day - NIMA .4959
3. Pounds of Atlantic mesh, NIMA and NGA, 580,800 Cost $40,376.06
4. Pounds of twine mesh, NIMA and NGA 108,272 Cost $20,426.40

REPORTS ON RISKS ERADICATION IN INDIAN EMPIRE

The following tables represent a summary of the work performed on
and Cabinet Project:

SUMMARY OF RIBES ERADICATION 1934
INLAND EMPIRE

TABLE NO. 3

SUMMARY OF ALL WORKINGS

Name	Eradication Type	Acres First Working	Acres Second Working	Acres Third Working	Total Effective Man-Days	Total Ribes	Gallons Spray	Total Cost
ECW Camps	Open Reproduction	64,465	1,408		90,561	18,560,798		
	Dense Reproduction	4,648	225		4,715	378,169		
	Open Pole	17,115	329		11,367	1,852,368		
	Dense Pole	8,104			2,923	342,206		
	Open Mature	78,938	1,166		51,855	8,066,970		
	Dense Mature	7,658	296		1,066	96,674		
	Cut Over	8,483	615		11,875	3,574,702		
	Brush	2,885	434		4,724	545,095		
	Burn	705			1,119	680,016		
	Subalpine	534			694	155,783		
	Meadow	456						
	All Upland	193,991	4,473		180,899	34,252,781		
	Stream (Hand)	9,871	3,635	833	37,544	7,100,453		
	Stream (Chemical)	1,705	551	14	8,079		226,946	
	Stream (Slash)	610			6,909			
	All Stream	10,455	3,635	833	52,532	7,100,453		
	All Types	204,446	8,108	833	233,431	41,353,234		
NIRA Camps	Open Reproduction	92,590	2,180		72,450	26,760,207		$ 572,620.17
	Dense Reproduction	22,325	645		6,864	1,393,912		52,684.30
	Open Pole	91,011	5,909		31,137	6,941,170		244,931.47
	Dense Pole	21,492	1,224		5,240	943,523		40,460.45
	Open Mature	170,041	2,363		70,012	20,303,616		541,340.11
	Dense Mature	13,524	44		1,757	183,229		13,572.43
	Cut Over	3,887	672		5,206	1,839,457		38,835.66
	Selective Cut Over	752			297	1,385,839		2,567.72
	Brush	5,630			4,014	1,280,289		32,045.95
	Burn	1,451			922	957,391		7,383.25
	Subalpine	519			211	95,161		1,720.25
	All Upland	423,222	13,037		198,110	61,083,794		1,548,161.76
	Stream (Hand)	14,653	4,417	914	33,567	11,257,283		262,162.43
	Stream (Chemical)	1,549	448	63	5,443		161,071	68,745.99
	Stream (Slash)	234			1,743			13,502.39
	Stream (Machine)	393			1,814			19,719.05
	All Stream	15,280	4,417	914	42,567	11,257,283		364,129.86
	All Types	438,502	17,454	914	240,677	72,341,077		$1,912,291.62
ECW and NIRA Camps	Open Reproduction	157,055	3,588		163,011	45,321,005		
	Dense Reproduction	26,973	870		11,579	1,772,081		
	Open Pole	108,126	6,238		42,504	8,793,538		
	Dense Pole	29,596	1,224		8,163	1,285,729		
	Open Mature	248,979	3,529		121,867	28,370,586		
	Dense Mature	21,182	340		2,823	279,903		
	Cut Over	12,370	1,287		17,081	5,414,159		
	Selective Cut Over	752			297	385,839		
	Brush	8,515	434		8,738	1,825,384		
	Burn	2,156			2,041	1,637,407		
	Subalpine	1,053			905	250,944		
	Meadow	456						
	All Upland	617,213	17,510		379,009	95,336,575		
	Stream (Hand)	24,524	8,052	1,747	71,111	18,357,736		
	Stream (Chemical	3,254	999	77	13,522		388,017	
	Stream (Slash)	844			8,652			
	Stream (Machine)	393			1,814			
	All Stream	25,735	8,052	1,747	95,099			
	All Types	642,948	25,562	1,747	474,108	113,694,311		

Annual Report 1934
H. E. Swanson

TABLE NO. 3A

FIRST WORKING

Name	Eradication Type	Acres	Effective Man Days	Total Ribes	Gallons Spray	Total Cost	Per Acre Basis			
							Man Days	Ribes	Gallons Spray	Cost
ECW Camps	Open Reproduction	64,465	86,241	18,257,094			1.34	283		
	Dense Reproduction	4,648	4,495	348,170			.97	75		
	Open Pole	17,115	11,120	1,834,056			.65	107		
	Dense Pole	8,104	2,923	342,206			.36	42		
	Open Mature	78,938	51,096	8,018,495			.65	102		
	Dense Mature	7,658	1,023	95,826			.13	13		
	Cut Over	8,483	11,035	3,552,535			1.30	419		
	Brush	2,885	4,140	461,082			1.44	160		
	Burn	705	1,119	680,016			1.59	965		
	Subalpine	534	694	155,783			1.30	292		
	Meadow	456								
	All Upland	193,991	173,886	33,745,263			.90	174		
	Stream (Hand)	9,871	28,668	5,697,134			2.90	577		
	Stream (Chemical)	1,705	7,057		200,573		4.14		118	
	Stream (Slash)	610	6,909				11.33			
	All Stream	10,455	42,634	5,697,134			4.08	545		
	All Types	204,446	216,520	39,442,397			1.06	193		
NIRA Camps	Open Reproduction	92,590	71,367	26,606,731		$564,549.15	.77	287		$6.10
	Dense Reproduction	22,325	6,762	1,376,536		51,904.20	.30	62		2.32
	Open Pole	91,011	29,941	6,844,745		235,725.73	.33	75		2.59
	Dense Pole	21,492	5,001	920,492		38,627.45	.23	43		1.80
	Open Mature	170,041	69,664	20,255,175		538,739.70	.41	119		3.17
	Dense Mature	13,524	1,728	179,220		13,358.13	.13	13		.99
	Cut Over	3,887	4,667	1,768,536		34,852.68	1.20	455		8.97
	Selective Cut Over	752	297	385,839		2,567.72	.39	513		3.41
	Brush	5,630	4,014	1,280,289		32,045.95	.71	227		5.69
	Burn	1,451	922	957,391		7,383.25	.64	660		5.09
	Subalpine	519	211	95,161		1,720.25	.41	183		3.31
	All Upland	423,222	194,574	60,670,115		1,521,474.21	.46	143		3.59
	Stream (Hand)	14,653	29,373	10,463,563		227,200.32	2.00	714		15.51
	Stream (Chemical)	1,549	4,713		147,787	60,150.18	3.04		95	38.83
	Stream (Slash)	234	1,743			13,502.39	7.45			57.70
	Stream (Machine)	393	1,814			19,719.05	4.67			50.18
	All Stream	15,280	37,643	10,463,563		320,571.94	2.46	714		20.98
	All Types	438,502	232,217	71,133,678		$1,842,046.15	.53	162		$4.20
ECW and NIRA Camps	Open Reproduction	157,055	157,608	44,863,825			1.00	286		
	Dense Reproduction	26,973	11,257	1,724,706			.42	64		
	Open Pole	108,126	41,061	8,678,801			.38	80		
	Dense Pole	29,596	7,924	1,262,698			.27	43		
	Open Mature	248,979	120,760	28,273,670			.49	114		
	Dense Mature	21,182	2,751	275,046			.13	13		
	Cut Over	12,370	15,702	5,321,071			1.27	430		
	Selective Cut Over	752	297	385,839			.39	513		
	Brush	8,515	8,154	1,741,371			.96	205		
	Burn	2,156	2,041	1,637,407			.95	759		
	Subalpine	1,053	905	250,944			.86	238		
	Meadow	456								
	All Upland	617,213	368,460	94,415,378			.60	153		
	Stream (Hand)	24,524	58,041	16,160,697			2.37	659		
	Stream (Chemical)	3,254	11,770		348,360		3.62		107	
	Stream (Slash)	844	8,652				10.25			
	Stream (Machine)	393	1,814				4.67			
	All Stream	25,735	80,277	16,160,697			3.12	659		
	All Types	642,948	448,737	110,576,075			.70	172		

TABLE NO. 3B

SECOND WORKING

Name	Eradication Type	Acres	Effective Man Days	Total Ribes	Gallons Spray	Total Cost	Per Acre Basis			
							Man Days	Ribes	Gallons Spray	Cost
ECW Camps	Open Reproduction	1,408	4,320	303,704			3.07	216		
	Dense Reproduction	225	220	29,999			.98	133		
	Open Pole	329	247	18,312			.75	56		
	Open Mature	1,166	759	48,475			.65	42		
	Dense Mature	296	43	848			.15	3		
	Cut Over	615	840	22,167			1.37	36		
	Brush	434	584	84,013			1.35	194		
	All Upland	4,473	7,013	507,518			1.57	113		
	Stream (Hand)	3,635	7,448	1,205,749			2.05	332		
	Stream (Chemical)	551	991		25,251		1.80		46	
	All Stream	3,635	8,439	1,205,749			2.32	332		
	All Types	8,108	15,452	1,713,267			1.91	111		
NIRA Camps	Open Reproduction	2,180	1,083	153,476		$ 8,071.02	.50	70		$3.70
	Dense Reproduction	645	102	17,376		780.10	.16	27		1.21
	Open Pole	5,909	1,196	96,425		9,205.74	.20	16		1.56
	Dense Pole	1,224	239	23,031		1,833.00	.20	19		1.50
	Open Mature	2,363	348	48,441		2,600.41	.15	20		1.10
	Dense Mature	44	29	4,009		214.30	.66	91		4.87
	Cut Over	672	539	70,921		3,982.98	.80	106		5.93
	All Upland	13,037	3,536	413,679		26,687.55	.27	32		2.05
	Stream (Hand)	4,417	3,561	671,786		29,489.50	.81	152		6.68
	Stream (Chemical)	448	616		11,362	7,276.33	1.38		25	16.24
	All Stream	4,417	4,177	671,786		36,765.83	.95	152		8.32
	All Types	17,454	7,713	1,085,465		$63,453.38	.44	62		$3.64
ECW and NIRA Camps	Open Reproduction	3,586	5,403	457,180			1.51	127		
	Dense Reproduction	870	322	47,375			.37	54		
	Open Pole	6,238	1,443	114,737			.23	18		
	Dense Pole	1,224	239	23,031			.20	19		
	Open Mature	3,529	1,107	96,916			.31	27		
	Dense Mature	340	72	4,857			.21	14		
	Cut Over	1,287	1,379	93,088			1.07	72		
	Brush	434	584	84,013			1.35	194		
	All Upland	17,510	10,549	921,197			.60	53		
	Stream (Hand)	8,052	11,009	1,877,535			1.37	233		
	Stream (Chemical)	999	1,607		36,613		1.61		37	
	All Stream	8,052	12,616	1,877,535			1.57	233		
	All Types	25,562	23,165	2,796,732			.91	109		

TABLE NO. 3C

THIRD WORKING

Name	Eradication Type	Acres	Effective Man Days	Total Ribes	Gallons Spray	Total Cost	Per Acre Basis			
							Man Days	Ribes	Gallons Spray	Cost
ECW Camps	Stream (Hand)	833	1,428	197,570			1.71	237		
	Stream (Chemical)	14	31		1,122		2.21		80	
	All Stream	833	1,459	197,570			1.75	237		
NIRA Camps	Stream (Hand)	914	633	121,934		$ 5,472.61	.69	133		$5.99
	Stream (Chemical)	63	114		1,922	1,319.48	1.81		31	20.94
	All Stream	914	747	121,934		$ 6,792.09	.82	133		$7.43
ECW and NIRA Camps	Stream (Hand)	1,747	2,061	319,504			1.15	183		
	Stream (Chemical)	77	145		3,044		1.88		40	
	All Stream	1,747	2,206	319,504			1.26	183		

Annual Report 1934
H. E. Swanson

TABLE NO. 4

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1934
INLAND EMPIRE

Working	Number of Acres Worked by Ownership Classes						Total Acres
	Federal	State				Private	
		Idaho	Washington	Montana	Total		
First	389,969	65,005	1,780	435	67,220	185,759	642,948
Second	17,192	2,140			2,140	6,230	25,562
Taird	1,195	100			100	452	1,747
Total	408,206	67,245	1,780	435	69,460	192,441	670,257

Table [illegible]

OWNERSHIP OF FARM CONTENT OF NEWS MADISON, 1956
[illegible]

[illegible]	Number of Acres Worked by Ownership Classes						Total Acres
		State					
	Federal	Idaho	[illegible]	[illegible]	[illegible]	[illegible]	
First	345,557	65,000	1,700	500	67,200	183,736	642,393
Second	17,192	2,146			2,140	6,280	29,858
Third	1,176	104					[illegible]
Total	406,205	67,246	1,700	[illegible]	[illegible]	[illegible]	[illegible]

CHEMICAL ERADICATION METHODS, 1934

Clarkia, Idaho - St. Joe National Forest
Orogrande Creek - Clearwater National Forest
By
H. E. Swanson, Agent
V. D. Moss, Agent

INTRODUCTION

The program of the chemical eradication methods unit consisted of a check on the experimental work performed during 1933 at Clarkia, Idaho, St. Joe National Forest. In addition, further experimentation was conducted using spraying and hand pulling eradication methods to destroy the surviving Ribes on areas that had been sprayed the previous season. The work was located within the control area of the St. Joe project. The experimental work served to destroy heavy concentrations of Ribes on a considerable area of stream type which otherwise would have been worked by regular eradication crews.

The results of one experiment performed on Orogrande Creek on the Clearwater National Forest in 1933 were checked in 1934. These results are included in table No. 3. The rest of this report deals with the experiments carried on at Clarkia, Idaho.

ORGANIZATION AND COST OF WORK

The experimental work was carried on by a crew of ten men under the direction of a supervisor. This crew was stationed and subsisted at the Clarkia Ranger Station.

The following represents the expenditures charged to the experimental work:

Salaries, Permanent Men.....	$1,853.26
Wages, Temporary Men.....	2,000.69
Equipment.....	94.50
Other Supplies.....	68.78
Transportation and Travel.....	1,138.89
Total Cost*.....	$5,156.12

*Subsistence for the men and chemicals were supplied by the St. Joe project.

OUTLINE OF EXPERIMENTS

The following experimental work was carried on during the 1934 season:

1. Plot studies testing the effectiveness of Atlacide, ammonium thiocyanate and mixtures of Atlacide and zinc chloride solutions when applied to the aerial portions of Ribes bushes and to the soil. These studies also included the retreatment of Ribes.

retreatment of Ribes".

portions of Ribes bushes and to the soil". These studies also included the

1. Plot studies testing the effectiveness of Atlacide, ammonium thiocyanate

The following experimental work was carried on during the 1944 season:

*Subsistence for the men and chemicals were supplied by the st.Joe

project.

2. Plot studies testing the effectiveness of light single treatments of Atlacide and ammonium thiocyanate solutions to Ribes.

3. Studies testing the effectiveness of late season ground applications of Atlacide and ammonium thiocyanate solutions to individual Ribes bushes.

4. Studies testing the effectiveness of spraying and hand pulling methods for mop-up work on Ribes inerme areas.

5. Special experiment treating a R. inerme area with an ammonium thiocyanate solution to prepare the area for burning Ribes and brush in place.

SITE AND RIBES CLASSIFICATION

1. Site Classification

The nature of the stream bottom along the St. Maries River below Clarkia, Idaho made it possible to establish two distinct site classifications.

Site I, representing low stream type, includes those areas very close to the level of the water table which are covered with water during the spring thaws and heavy fall rains. The soil is composed of compact clays, loams, and fine sands. There is little or no duff and humus present. Low brush species and herbaceous plants predominate on these areas with no trees present. The soil is always moist or wet, but with no surface standing water during the growing season. Under these conditions, the Ribes bushes tend to have shallow and fibrous root systems.

Site II, representing high or bench stream type, includes areas sufficiently above the water table to be free from the normal stream overflow, and are only flooded in times of excessively heavy precipitation or high water. The soil is composed of a porous mixture of clays and medium to coarse sands which tend to promote the development of large, spreading, and often deep root systems on Ribes bushes. Various thicknesses of litter, duff and humus are present as surface coverings. The soil is generally dry during the summer period. High brush species predominate on these areas and occasionally trees are present.

2. Ribes Classification

In stream type, Ribes occur in clumps and as individual bushes. Each situation requires different methods of chemical treatment in order to obtain maximum efficiency. In checking the results of the 1933 work, Ribes bushes were classified as they occurred singly or in clumps. Ribes bushes that were not crowded and possessed distinct root crowns or root centers were classed as single bushes. Ribes bushes that were noticeably crowded and matted together, having few or no distinct root crowns, were classed as bushes in clumps.

3. Plot studies testing the effectiveness of liquid Atlacide and ammonium thiocyanate solutions to Ribes.

3. Studies testing the effectiveness of late season ground application of Atlacide and ammonium thiocyanate solutions to individual Ribes bushes.

4. Studies testing the effectiveness of spraying and hand pulling for mop-up work on Ribes incense areas.

5. Special experiment treating a ½ incense area with an ammonium thiocyanate solution to prepare the area for burning Ribes and brush in place.

SITE CLASSIFICATION

1. Site Classification

The nature of the stream bottom along the St. Maries River below Clarkia, Idaho made it possible to establish two distinct site classifications.

Site I, representing low stream type, includes those areas very close to the level of the water table which are covered with water during the spring thaws and heavy fall rains. The soil is composed of compact clays, loams, and fine sands. There is little or no duff and humus present. Low brush species and herbaceous plants predominate on these areas with no trees present. The soil is always moist or wet, but with no surface standing water during the growing season. Under these conditions, the Ribes bushes tend to have small and fibrous root systems.

Site II, representing high or bench stream type, includes areas sufficiently above the water table to be free from the normal stream overflow, and are only flooded in times of abnormally high water. The soil is composed of a porous mixture of light, granular, and heavy soils which tend to provide the development of large, extensive root systems on Ribes bushes. Various brush species and herbaceous plants predominate on these areas and occasionally trees are present. High brush species predominate on these areas during the summer period, as surface moisture, the soil dry during the summer period.

2. Ribes Classification

In stream type, Ribes occur in clumps and as individual bushes. Such situation requires different methods or chemical treatment to secure the maximum efficiency. In the case of the Ribes are classified as to clump, Ribes bushes that were originally crowded, were classed as bushes in clumps. Ribes bushes that were originally crowded, were classed as bushes in clumps. Such bushes had developed distinct root crowns, but had few or no distinct root crowns, were classed as bushes in clumps.



W-115. Site No. I. Low stream type.



W-1295. Site No. II. High stream or bench type.

METHOD OF TREATMENT

In the course of several seasons of experimentation on R. inerme in methods of applying chemical, most successful results have been obtained from treatments applied to the root crowns and the soil representing the root distribution of the plant, in addition to the treatment of the aerial plant parts. Problems that have not been satisfactorily solved are: The proper dosage and concentration of solution to apply, and the coordination of an initial application made during one year with a mop-up treatment the following year, in order to obtain complete destruction of Ribes at the lowest cost.

Treatment of Ribes bushes in clumps was accomplished by instructing the crewman to first push the nozzle of the pump down into and around the mass of root crowns and root centers. This initial step was essentially necessary in order to apply a large amount of chemical solution directly to and in the vicinity of root masses where the greatest absorption of chemical takes place.

Although considerable time could be spent on each Ribes clump by such a method of chemical treatment, the men were instructed to treat only those root crowns and root masses that could be easily located. This treatment was followed by applying a general broadcast soil drench over the entire area covered by the clump of Ribes. This double treatment method insures greater efficiency and decreases the amount of time required for searching, as against an attempt to find and treat each root center in the clump separately.

The treatment of the roots was followed by a complete coverage of the aerial parts of the Ribes with chemical spray. This same procedure was followed in the case of the single bushes, a direct application of solution to the root crowns and an application to the leaves and stems.

The objective in the various tests which were made was to apply specified amounts of chemical solution most effectively. The treatment, in which smaller volumes of solution were used, necessitated a very selective and careful application in order to cover the specified amount of area. In the case of the larger volumes, the applications were made more in the broadcast manner, although the method of applying the solution directly to the root centers was followed.

RESULTS OF WORK PERFORMED

The results obtained on the five principal experimental studies are shown below:

1. Plot studies testing the effectiveness of Atlacide, ammonium thiocyanate and mixtures of Atlacide and zinc chloride solutions when applied to the aerial portions of Ribes bushes and to the soil. The studies also included the retreatment of Ribes. See table No. 1.

In the course of several seasons of experimentation on R. Ribes [illegible] methods of applying chemical, most successful results have been obtained [illegible] treatments applied to the root crowns and the soil [illegible] the [illegible] tion of the plant, in addition to the treatment of the aerial plant parts. [illegible] that have not been satisfactorily solved are: The proper dosage and concentration [illegible] of solution to apply, and the [illegible] one year with a mop-up treatment the following year, in order to obtain complete destruction of Ribes at the lowest cost.

Treatment of Ribes bushes in clumps was accomplished by instructing the crewman to first push the nozzle of the pump down into and around the mass of root crowns and root centers. This initial step was essentially necessary in order to apply a large amount of chemical solution directly to and in the vicinity of the masses where the greatest absorption of chemical takes place.

Although considerable time could be spent on each Ribes clump by [illegible] method of chemical treatment, [illegible] crowns and root masses that could be easily located. This treatment was followed by applying a general treatment [illegible] clump of Ribes. This double treatment method insures greater efficiency by decreases the amount of time required for searching, as against an attempt to [illegible] and treat each root center in the clump separately.

The treatment of the roots was followed by a complete coverage of the [illegible] the case of the single bushes, a direct application of solution to the root crown and an application to the leaves and stems.

The objective in the various tests [illegible] was to apply a specified amounts of chemical solution most effectively. The [illegible], in which small volumes of solution were used, necessitated a very selective and careful manipulation [illegible] the applications were made more in the broadcast manner, although the method of applying the solution directly to the root centers was followed.

RESULTS OF WORK PERFORMED

The results obtained on the five principal experimental studies are shown below:

1. Plot studies testing the effectiveness of Atlacide, ammonium thiocyanate and mixtures of Atlacide and zinc chloride solutions when applied to the aerial portions of Ribes bushes and to the soil. The acetate also included the treatment of Ribes. See table No. 1.

TABLE NO. 1

EFFECTIVENESS OF APPLICATIONS OF ATLACIDE, AMMONIUM THIOCYANATE, AND MIXTURES OF ATLACIDE AND ZINC CHLORIDE TO RIBES

Plot No.	Chemical	Pounds Chemical per Acre of Ribes	No. Acres Checked	Site	Ribes inerme: Live Bushes: No. Bu.	Live Bushes: Feet Live Stem	Live Bushes: Feet Dead Stem	Dead Bushes: No. Bu.	Dead Bushes: Feet Dead Stem	Per cent Bush Kill: Total	Per cent Bush Kill: Single Bushes	Per cent Bush Kill: Bushes in Clumps	No. First Year Seedlings	Ribes lacustre: Live Bushes: No. Bu.	Live Bushes: Feet Live Stem	Live Bushes: Feet Dead Stem	Dead Bushes: No. Bu.	Dead Bushes: Feet Dead Stem	Per cent Bush Kill: Total	Per cent Bush Kill: Single Bushes	Per cent Bush Kill: Bushes in Clumps	No. First Year Seedlings	Ribes petiolare: Live Bushes: No. Bu	Live Bushes: Feet Live Stem	Live Bushes: Feet Dead Stem	Dead Bushes: No. Bu.	Dead Bushes: Feet Dead Stem	Per cent Bush Kill: Total	Per cent Bush Kill: Single Bushes	Per cent Bush Kill: Bushes in Clumps	No. First Year Seedlings
		750		Low	176	518	3,983	283	5,235	62	84	40	46	1	2	5	28	417	97	100	94	2	0	0	0	439	17,518	100	100	100	1
1-A	Atlacide	750	.7	High	824	28,493	4,081	602	11,029	42	60	24	671	19	47	106	16	319	46	60	32	16	0	0	0	176	6,343	100	100	100	5
		1,125		Low	15	48	336	43	751	74	89	59	38	0	0	0	12	243	100	0	100	3	0	0	0	207	8,769	100	100	100	9
2-A	Atlacide	1,125	.6	High	317	10,183	4,988	328	8,319	51	67	35	605	44	153	229	153	1,251	78	90	66	41	2	7	34	263	10,312	99	100	98	15
		1,500		Low	61	392	1,862	233	5,392	79	92	66	42	0	0	0	16	362	100	100	100	9	0	0	0	313	12,293	100	100	100	7
3-A	Atlacide	1,500	.8	High	570	22,379	3,753	686	13,539	55	72	38	457	27	41	116	153	1,178	85	94	76	52	0	0	0	202	8,456	100	100	100	18
				Low	37	174	694	251	3,146	87	94	80	36	0	0	0	27	394	100	100	100	7	0	0	0	208	8,622	100	100	100	2
4-A	Atlacide	3,000	.6	High	216	4,037	3,516	573	17,681	73	81	65	324	27	83	162	167	1,477	86	95	77	48	0	0	0	184	7,254	100	100	100	11
				Low	33	104	518	317	4,028	90	96	84	29	0	0	0	19	436	100	100	100	1	0	0	0	197	9,716	100	100	100	1
5-A	Atlacide	5,350	.6	High	281	5,179	5,791	793	23,517	74	82	66	231	21	55	141	157	1,320	88	97	79	25	0	0	0	256	10,308	100	100	100	16
				Low	12	57	329	288	6,729	96	98	94	26	0	0	0	22	405	100	100	100	4	0	0	0	273	11,185	100	100	100	2
6-A	Atlacide	7,500	.5	High	111	2,323	3,817	729	24,190	87	90	84	163	17	46	112	137	1,023	89	98	80	17	0	0	0	216	10,043	100	100	100	10
	Ammonium	500		Low	47	167	2,031	321	9,342	87	91	83	114	0	0	0	12	237	100	100	100	13	6	16	174	293	12,360	98	100	98	33
1-NH	thiocyanate	500	.5	High	397	11,816	7,117	489	12,514	55	67	43	973	16	33	86	11	216	41	56	26	62	3	10	47	204	9,932	98	100	98	241
	Ammonium	750		Low	3	14	113	147	5,316	98	100	96	158	0	0	0	8	112	100	100	100	28	11	38	471	141	5,815	93	96	90	54
2-NH	thiocyanate	750	.4	High	377	11,413	5,672	618	15,981	62	70	54	1,179	19	31	152	85	843	82	87	77	74	247	1,136	2,176	183	7,160	42	47	37	285
	Ammonium	1,000		Low	2	19	83	78	2,630	98	100	96	203	0	0	0	9	121	100	100	100	51	55	263	1,723	416	16,425	88	92	84	51
3-NH	thiocyanate	1,000	.4	High	201	7,237	3,624	528	17,508	72	76	68	1,316	20	32	147	96	927	83	88	78	93	327	1,898	3,631	411	16,038	56	62	50	316
	Ammonium			Low	1	7	51	53	1,816	98	100	96	223	0	0	0	5	84	100	100	0	62	53	247	1,319	391	15,204	89	93	85	58
4-NH	thiocyanate	2,000	.5	High	62	1,810	1,233	443	11,372	88	91	85	1,706	13	19	63	87	856	87	93	81	129	233	1,017	1,911	747	31,173	76	83	69	342
	Ammonium			Low	14	53	719	307	7,824	96	98	94	243	0	0	0	8	95	100	100	100	56	32	186	963	329	14,761	91	95	87	91
5-NH	thiocyanate	3,500	.6	High	151	2,632	3,406	884	26,293	85	89	81	1,461	52	95	328	319	2,827	86	93	79	138	48	221	1,167	263	10,819	85	91	79	307
	Ammonium			Low	2	7	82	257	4,318	99	100	98	167	0	0	0	13	256	100	100	100	42	30	188	1,090	407	15,924	94	97	91	51
6-NH	thiocyanate	5,000	.4	High	84	815	1,638	743	22,315	90	93	87	1,193	30	77	303	257	2,107	93	98	88	117	51	152	853	337	14,392	87	93	81	313
	Atlacide	1,600																												
	Zinc			Low	121	1,109	4,327	82	3,062	40	46	34	33	67	316	3,118	48	503	42	49	35	2	62	384	2,724	83	4,215	57	66	48	1
1-$ZnCl_2$	chloride	300	.6	High	326	2,841	11,526	119	4,517	27	33	21	463	96	469	4,403	45	472	39	45	33	11	69	397	2,917	27	1,852	28	35	21	7
	Atlacide	1,000																												
	Zinc			Low	194	1,473	8,013	68	2,623	27	32	22	38	52	260	2,071	31	366	37	45	29	5	35	283	1,450	37	2,516	51	60	42	13
2-$ZnCl_2$	chloride	600	.3	High	383	2,948	14,612	71	3,129	16	19	13	312	105	573	4,320	33	354	24	28	20	14	76	592	3,529	21	1,683	22	25	19	27
	Atlacide	800																												
	Zinc			Low	97	774	4,129	29	967	23	26	21	23	31	185	1,316	13	209	30	36	24	3	16	96	813	13	914	45	55	35	9
3-$ZnCl_2$	chloride	800	.3	High	155	1,257	7,138	23	850	13	15	11	281	73	452	3,369	12	297	14	17	11	21	37	244	1,746	8	758	18	21	15	5
	Atlacide	1,600																												
	Zinc			Low	137	997	7,006	46	1,714	25	29	21	20	18	72	763	9	287	33	37	29	2	26	133	1,519	13	1,016	33	39	27	1
4-$ZnCl_2$	chloride	300	.3	High	233	1,753	9,316	52	2,306	18	17	9	216	32	178	1,560	7	193	18	23	13	15	45	219	2,635	12	943	21	23	19	15
	Atlacide	1,000																												
	Zinc			Low	209	1,553	8,731	31	1,463	13	14	12	34	15	74	605	4	158	21	23	19	6	28	124	1,670	10	821	26	29	23	5
5-$ZnCl_2$	chloride	600	.6	High	260	2,031	11,308	33	1,611	11	12	10	352	25	109	834	5	179	17	19	15	27	43	306	2,842	7	693	14	17	11	8
	Atlacide	800																												
	Zinc			Low	195	1,562	8,451	17	983	8	9	7	19	16	83	913	3	84	15	16	8	4	34	145	2,029	7	665	17	20	14	3
6-$ZnCl_2$	chloride	800	.2	High	244	2,473	10,239	20	1,135	8	9	7	197	50	318	3,205	5	143	9	6	3	13	54	265	3,321	8	748	13	16	10	11

Treatments made 1933. Results checked 1934.

Plots 1-A, 2-A, 3-A, 1-NH, 2-NH, 3-NH were sprayed twice during 1933 using the same treatment each time. To test results of single application, one square chain of area on each plot was not resprayed.

See Table No. 4 for amounts of water used with chemical.

A higher percentage of the Ribes bushes occupying the low stream site was killed by chemical treatments than was killed on the high stream site. The effectiveness of chemical treatment is influenced greatly by three environmental factors, namely, porosity of soil, root distribution and the accumulation of surface coverings over the mineral soil. The degree of effectiveness will depend upon the amount of chemical solution infiltrating through the layers of litter, duff and humus to the soil, the distribution of absorbing roots and the ability of the soil to hold this solution adjacent to or within the vicinity of these roots until a sufficient quantity has been absorbed.

On site I, these conditions were favorable to effective chemical action. Site II presents a more difficult problem and the method of chemical treatment had to be modified to obtain satisfactory results. The accumulation of litter, duff and humus prevents the application of the solution directly to the soil, making it necessary to push the pump nozzle beneath this accumulation and place the solution in contact with the roots. The porous nature of the soil permits a rapid movement of the solution and consequently it is not held adjacent to the roots long enough to assure maximum absorption. It is necessary therefore to thoroughly saturate the soil with chemical solution on the area representing root distribution in order to obtain satisfactory results.

During the course of the season, aerial treatments become less effective and soil applications give more satisfactory results. Soil drenches require more solution and the amounts required to obtain a satisfactory kill increase as the season progresses. It is apparent that a satisfactory kill cannot be obtained after the middle of August, without a very heavy soil application.

The kill resulting from the second application of chemicals the same season is relatively small. More effective results can be obtained by delaying second treatment on R. inerme and R. lacustre areas until the following year. Then it is possible to confine the treatment to those bushes surviving through the winter.

Atlacide, in all the tests, was more effective on R. petiolare than either ammonium thiocyanate or mixtures of Atlacide and zinc chloride. Atlacide becomes more effective on R. inerme and R. lacustre as the concentration and dosage increase. This greater effectiveness is a direct result of the soil drench. A considerable amount of chlorate injury appears on the regrowth of surviving Ribes bushes during the same season and often in the following year. In some instances, this injury is severe enough to permanently kill the Ribes plants.

Areas treated with Atlacide are more easily reworked than those treated with ammonium thiocyanate because of the relative absence of herbaceous growth and the open conditions on the former as compared to the latter. Fewer Ribes seedlings come in following Atlacide treatments. The number of these seedlings decreases as the amount of chemical applied increases.

Ammonium thiocyanate is somewhat more effective than Atlacide on R. inerme and R. lacustre. This is more apparent following a second application made during the same season. The effectiveness of ammonium thiocyanate on these two species of Ribes increases as the quantity of chemical applied is increased. As in the case of Atlacide treatments, the effectiveness increases from the influence of the soil drench by placing a larger amount of chemical in contact with the absorbing roots.

A higher percentage of the Ribes bushes occupying the [illegible] was killed by chemical treatments than was killed on the [illegible] effectiveness of chemical treatment is influenced greatly by [illegible] factors, namely, porosity of soil, root distribution and [illegible] face coverings over the mineral soil. The degree of [illegible] the amount of chemical solution infiltrating through the [illegible] humus to the soil, the distribution of absorbing roots [illegible] to hold this solution adjacent to or within the vicinity of [illegible] sufficient quantity has been absorbed.

On site I, these conditions were favorable to effective chemical [illegible]. Site II presents a more difficult problem and the method of chemical treatment [illegible] to be modified to obtain satisfactory results. The accumulation of litter, [illegible] and humus prevents the application of the solution directly to the soil, making it necessary to push the pump nozzle beneath this accumulation and place the solution in contact with the roots. The porous nature of the soil permits a rapid movement of the solution and consequently it is not held adjacent [illegible] to assure maximum absorption. It is necessary therefore [illegible] the soil with chemical solution on the area repeatedly [illegible] to obtain satisfactory results.

During the course of the season [illegible] solution and the amounts required to obtain a satisfa[illegible] after the middle of August, without a very heavy soil application.

The kill resulting from the second application of [illegible] season is relatively small. More effective results can be obtained [illegible] second treatment on R. inerme and R. lacustre curbs until the [illegible] it is possible to confine the treatment to those bushes susceptible [illegible] victor.

[illegible] either ammonium thiocyanate or mixtures of A[illegible] become more effective on R. inerme and R. lacustre [illegible] dosage increase. This greater effectiveness is a [illegible] A considerable amount of chlorate injury appears on the [illegible] bushes during the same season and often in the following [illegible] this injury is severe enough to permanently kill the [illegible]

Areas treated with Atlacide are more easily recognized than those treated with ammonium thiocyanate because of the relative absence of [illegible] the open conditions on the former as compared to the latter. Other [illegible] come in following Atlacide treatments. The number of these seedlings increases as the amount of chemical applied increases.

Ammonium thiocyanate is somewhat more effective than Atlacide on R. inerme and R. lacustre. This is more apparent following a second [illegible] the same season. The effectiveness of ammonium thiocyanate on these two [illegible] of Ribes increases as the quantity of chemical applied is increased. As in the case of Atlacide treatments, the effectiveness increases from the [illegible] soil drench by placing a larger amount of chemical in contact with the absorbing roots.

Ammonium thiocyanate is most effective on R. petiolare when applied in solutions of 1.1 pounds per gallon of water. However, it is not as satisfactory for use on this species of Ribes as Atlacide. The effectiveness of ammonium thiocyanate drops off materially when applied at the concentration of 1.76 pounds per gallon of water but thereafter increases. However, even with the heaviest treatment the results were not as satisfactory as were obtained with the lightest treatment applied. The reaction of ammonium thiocyanate on the aerial portion of R. petiolare is very rapid and the leaves collapse in less than one-half hour after treatment. If the soil conditions are favorable enough to hold the chemical adjacent to the absorbing roots until the surviving plants resume activity the chemical is absorbed and translocated. This was very apparent by all R. petiolare bushes releafing after treatment and later being killed back by the absorbed and translocated chemical from the roots. This releafing did not occur on the plot receiving the lightest treatment since the chemical solution was not so strong as to kill the leaves immediately. The dying of the Ribes was gradual, permitting the absorption of chemical through the roots. Consequently, more permanent injury resulted.

The kill resulting from the second application with ammonium thiocyanate was slightly greater than in the case of Atlacide, with the exception of treatments on R. petiolare.

The appearance of herbaceous plants following treatment with ammonium thiocyanate makes these areas difficult to rework. Numerous Ribes seedlings come in the following season and their growth is rapid. There is little or no secondary injury from ammonium thiocyanate treatments on the new growth on surviving Ribes. In most cases the growth of surviving bushes is stimulated.

Mixtures of Atlacide and zinc chloride in solution are less effective as the proportion of zinc chloride is increased. The various combinations were very ineffective on all species of Ribes. The zinc chloride in this mixture caused severe skin irritations on the men who were using it. This mixture has no practical use in the chemical eradication work.

2. Plot studies testing the effectiveness of light single treatments with Atlacide and ammonium thiocyanate solutions. See table No. 2.

TABLE NO. 2

EFFECTIVENESS OF SINGLE APPLICATIONS OF ATLACIDE AND AMMONIUM THIOCYANATE TO RIBES

Plot No.	Chemical Used	Treatment Per Acre of Ribes		Number of Square Feet in Plot	Ribes petiolare							Ribes inerme						
					Live Bushes			Dead Bu.		Per-cent Bush Kill	Per-cent Live Stem Kill	Live Bushes			Dead Bu.		Per-cent Bush Kill	Per-cent Live Stem Kill
		Pounds Chemical	Gallons Water		No. Bu.	Feet Live Stem	Feet Dead Stem	No. Bu.	Feet Dead Stem			No. Bu.	Feet Live Stem	Feet Dead Stem	No. Bu.	Feet Dead Stem		
1-A	Atlacide	750	500	4,436	0	0	0	241	5,493	100	100	1	7	9	6	131	85	95
2-A	Atlacide	1,125	500	4,436	0	0	0	154	2,731	100	100	1	5	12	7	143	87	97
3-A	Atlacide	1,500	1,000	4,436	0	0	0	203	4,438	100	100	0	0	0	5	71	100	100
1-NH	Ammonium thiocyanate	500	500	4,436	26	46	1,193	109	2,527	81	99	0	0	0	8	143	100	100
2-NH	Ammonium thiocyanate	750	500	4,436	86	456	1,428	90	2,074	51	90	1	3	27	4	82	80	97
3-NH	Ammonium thiocyanate	1,000	1,000	4,436	55	136	391	74	829	68	90	5	17	115	19	549	79	97

Treatments made 1933. Results checked 1934.
These areas were set aside from the original plots; no resprays were applied.

The plots were established in the low stream site where the bulk of the Ribes was R. petiolare with a few scattered R. inerme present.

Atlacide was 100 percent effective in all cases on R. petiolare. Its effectiveness on R. inerme increased as the quantity of chemical applied increased.

The effectiveness of ammonium thiocyanate on R. petiolare was greatest at the rate of 500 pounds per acre, decreased at 750 pounds, but increased thereafter, as the quantity of chemical increased.

The results of these experiments tend to confirm that the kill resulting from the second application of chemicals the same season is relatively small. The superiority of Atlacide in destroying R. petiolare is definitely shown.

3. Studies testing the effectiveness of late season ground applications of Atlacide and ammonium thiocyanate solutions to individual Ribes bushes. See table No. 3.

3. Studies testing the effectiveness of late season ground applications of Aliacide and ammonium thiocyanate solutions in [illegible]
do. 3.

TABLE NO. 3

EFFECTIVENESS OF LATE SEASON GROUND APPLICATIONS OF
SODIUM CHLORATE, ATLACIDE AND AMMONIUM THIOCYANATE TO RIBES

Series Number	Chemical	Lbs. Chemical Per Sq.Ft.	Sq.Ft. of Area Treated	Site	Ribes inerme							Ribes lacustre							Ribes petiolare						
					Live Bushes			Dead Bushes		Percent Bush Kill	No. First Year Seedlings	Live Bushes			Dead Bushes		Percent Bush Kill	No. First Year Seedlings	Live Bushes			Dead Bushes		Percent Bush Kill	No. First Year Seedlings
					No. Bu.	Feet Live Stem	Feet Dead Stem	No. Bu.	Feet Dead Stem			No. Bu.	Feet Live Stem	Feet Dead Stem	No. Bu.	Feet Dead Stem			No. Bu.	Feet Live Stem	Feet Dead Stem	No. Bu.	Feet Dead Stem		
I	Sodium Chlorate	.20	669	Low	10	27	167	165	1,813	94	7	7	39	107	129	1,278	95	12	0	0	0	8	273	100	0
II	Sodium Chlorate	.20	2,531	Low	61	953	1,429	178	3,516	79	26	0	0	0	23	324	100	2	0	0	0	154	5,421	100	2
				High	83	1,516	1,956	131	3,036	61	43	6	11	43	28	417	82	9	27	71	838	194	6,347	88	17
I	Sodium Chlorate	.10	230	Low	7	14	59	49	674	89	4	13	80	257	168	1,151	93	8	0	0	0	6	164	100	0
II	Sodium Chlorate	.10	4,762	Low	81	1,214	1,833	163	3,409	67	22	0	0	0	7	163	100	1	0	0	0	76	3,194	100	0
				High	138	1,463	3,208	144	2,827	51	37	8	17	75	23	358	74	6	36	87	1,136	121	4,523	77	12
I	Sodium Chlorate	.05	190	Low	32	322	384	70	1,119	69	13	11	42	113	52	358	83	10	0	0	0	7	232	100	0
II	Sodium Chlorate	.05	3,213	Low	33	528	752	61	1,623	65	17	0	0	0	26	407	100	1	0	0	0	94	4,206	100	1
				High	48	673	854	43	1,204	47	26	16	29	97	34	563	68	4	35	82	1,256	86	3,748	71	8
I	Ammonium Thiocyanate	.20	660	Low	13	36	182	66	692	84	23	15	31	129	184	1,357	92	16	5	58	93	11	210	69	4
II	Ammonium Thiocyanate	.20	1,957	Low	102	829	3,216	419	7,257	81	57	33	57	205	168	2,312	83	3	3	14	82	31	1,329	91	4
				High	266	1,278	5,411	347	6,324	57	96	97	137	1,234	104	1,843	52	14	7	26	163	49	1,636	87	21
I	Ammonium Thiocyanate	.10	604	Low	40	65	393	90	919	69	17	12	22	88	37	172	76	12	7	9	82	21	195	75	1
II	Ammonium Thiocyanate	.10	4,631	Low	49	313	627	158	3,528	76	38	16	33	88	61	1,128	79	1	9	38	258	61	2,412	87	2
				High	71	538	1,934	83	1,716	54	73	33	54	229	30	736	48	8	19	63	762	58	2,194	75	16
I	Ammonium Thiocyanate	.05	1,067	Low	141	762	512	97	1,823	41	28	11	29	39	20	178	65	6	4	16	39	5	63	56	0
II	Ammonium Thiocyanate	.05	12,004	Low	20	207	512	37	963	65	34	12	27	68	27	384	69	1	17	54	684	63	2,562	79	1
				High	47	383	683	44	1,342	48	66	27	66	128	23	309	45	6	47	118	1,564	76	3,280	62	10

Annual Report, 1934
Virgil D. Moss,

Series I Orogrande Creek — Treatments Sept. 23, 1933 — Results checked June 17, 1934
Series II Clarkia, Idaho — Treatments Sept. 25, 26, 27, 1933 — Results checked June 18, 19, 20, 1934
One gallon of water used per pound of chemical

In these tests, Atlacide was more effective than ammonium thiocyanate. Satisfactory results were obtained on R. petiolare with dosages of Atlacide at 2/10 pound and 1/10 pound per square foot of area treated. While these applications are in excess of amounts required during the normal spraying season, the results indicate that the spraying season can be extended later in the season when necessary by the use of the ground treatments. The season should not be extended later than the coming of the heavy fall rains as the wet soil so dilutes the chemical solution applied to the ground as to decrease its effectiveness. This accounts in part for the less satisfactory results obtained at Clarkia than on the Orogrande. Heavy rains occurred on the Clarkia areas immediately following the treatments.

4. Studies testing the effectiveness of spraying and hand pulling methods for mop-up work on R. inerme areas. See table No. 4.

In these tests, Aldacide was more effective than ammonium thiocyanate.
Satisfactory results were obtained on R. pedioleus with dosages of Aldacide at
2\10 pound and 1\10 pound per square foot of area treated. While these quan-
tities are in excess of amounts required during the normal spraying season, the
results indicate that the spraying season can be extended later in the season when
necessary by the use of the ground treatments. The season should not be extended
later than the coming of the heavy fall rains as the wet soil so dilutes the
chemical solution applied to the ground
accounts in part for the less satisfactory results obtained at Oberlin than at
the Orogrande. Heavy rains occurred on the Oberlin areas immediately following
the treatments.

4. Studies testing the effectiveness
for mop-up work on R. inermis areas. See tab

TABLE NO. 4

RESULTS OF FIELD TESTS ON RIBES INERME WITH SPRAYING METHODS ON FIRST WORKING AND SPRAYING AND HAND PULLING METHODS ON REWORK

Plot No.	Gross Area Number Acres	Ribes Area Number Acres	Results of 1933 Spray Work: Chemical	Dates of Spraying: First	Dates of Spraying: Second	Data on per Acre Basis: Gross Area: Man Days	Gross Area: Pounds Chemical	Gross Area: Gallons Solution	Ribes Area: Pounds Chemical	Ribes Area: Gallons Solution	Per cent Bush Kill: R. inerme	R. lacustre	R. petiolare	Rework in 1934: Chemical	Dates of Treatment	Data on per Acre Basis: Gross Area: Man Days	Gross Area: Pounds Chemical	Gross Area: Gallons Solution	Ribes Area: Ribes Pulled	Ribes Area: Pounds Chemical	Ribes Area: Gallons Solution	Cost per Gross Acre: 1933 and 1934	Cost per Gross Acre: Estimated Cost of Third Working	Cost per Gross Acre: Total Cost
1-A	3.67	1.54	Atlacide	7/12/33 7/29/33	8/28/33 9/4/33	8.9	644	429	1,535	1,023	52	71	100	Atlacide	6/4/34 6/13/34	3.2	417	273		1,637	1,069	$168.09	$18.00	$186.09
2-A	2.87	1.29	Atlacide	7/31/33 8/11/33	8/28/33 9/3/33	7.3	1,030	458	2,292	1,019	62	89	99		7/11/34 7/13/34	2.7			536			152.70	4.50	157.20
3-A	4.36	1.15	Atlacide	8/12/33 8/26/33	9/4/33 9/12/33	5.2	782	522	2,966	1,977	67	92	100		7/26/34 7/28/34	2.1			796			114.18	3.00	117.18
4-A	2.94	1.04	Atlacide	7/15/33 7/31/33		5.2	1,082	358	3,058	1,013	80	93	100		7/17/34 7/19/34	1.9			399			139.98	3.00	142.98
5-A	3.23	1.19	Atlacide	7/31/33 8/14/33		4.4	1,925	740	5,224	2,009	82	94	100		7/20/34 7/23/34	1.7			458			209.85	1.50	211.35
6-A	2.51	.99	Atlacide	8/16/33 8/29/33		3.4	2,994	798	7,560	2,016	91	94	100		7/24/34 7/25/34	1.5			206			298.86	.75	299.61
1-NH	2.71	1.39	Ammonium thiocyanate	7/12/33 7/28/33	8/28/33 9/3/33	8.5	515	515	1,005	1,005	71	70	98	Ammonium thiocyanate	7/13/34 7/17/34	2.0	453	237		2,113	1,623	150.12	12.00	162.12
2-NH	2.12	1.03	Ammonium thiocyanate	7/29/33 8/11/33	8/28/33 9/3/33	6.9	727	485	1,497	998	80	91	67	Ammonium thiocyanate	7/9/34 7/12/34	1.8	136	73		2,057	1,597	138.87	6.00	144.87
3-NH	1.69	.98	Ammonium thiocyanate	8/11/33 8/25/33	9/4/33 9/11/33	6.1	1,167	1,167	2,013	2,013	85	91	72	Ammonium thiocyanate	7/26/34 7/28/34	1.4	78	44		2,072	1,608	157.05	6.00	163.05
4-NH	2.37	1.09	Ammonium thiocyanate	7/15/33 7/30/33		5.3	924	462	2,007	1,004	93	93	82		7/17/34 7/19/34	1.6			548			124.56	6.00	130.56
5-NH	3.17	1.16	Ammonium thiocyanate	7/29/33 8/13/33		4.3	1,288	736	3,521	2,012	90	93	88		7/20/34 7/23/34	1.2			415			148.92	3.00	151.92
6-NH	2.07	1.02	Ammonium thiocyanate	8/15/33 8/28/33		3.1	2,452	981	4,975	1,990	94	96	90		7/24/34 7/25/34	.8			329			244.08	1.50	245.58
1-$ZnCl_2$	2.78	.83	Atlacide Zinc chloride	9/7/33 9/10/33		2.9	482 90	301	1,615 303	1,010	33	40	42	Ammonium thiocyanate	8/6/34 8/8/34	1.6	466	309		1,753	1,132	120.42	6.00	126.42
2-$ZnCl_2$	1.65	.66	Atlacide Zinc chloride	9/11/33 9/13/33		2.5	399 239	399	994 596	994	21	30	36	Ammonium thiocyanate	8/9/34 8/11/34	1.3	507	326		1,812	1,157	125.85	9.00	134.85
3-$ZnCl_2$	1.26	.27	Atlacide Zinc chloride	9/14/33 9/19/33		2.2	168 168	210	777 777	971	18	22	31	Ammonium thiocyanate	8/13/34 8/14/34	.7	523	329		1,625	1,048	94.71	6.00	100.71
4-$ZnCl_2$	1.41	.75	Atlacide Zinc chloride	8/23/33		9.9	187 35	117	353 67	221	21	25	27	Atlacide	5/22/34 5/23/34	.8	498	317		1,709	1,109	139.00	9.00	138.00
5-$ZnCl_2$	3.26	1.57	Atlacide Zinc chloride	8/24/33		3.7	44 26	44	91 54	91	12	19	20	Atlacide	5/24/34 5/30/34	1.9	541	334		1,678	1,073	88.59	15.00	103.59
6-$ZnCl_2$	1.09	.40	Atlacide Zinc chloride	8/25/33		7.3	55 55	69	149 149	186	8	12	15	Atlacide	5/31/34 6/2/34	.7	582	342		1,643	1,056	110.28	18.00	128.28

Plots 4, 5, 6 treated by CCC labor in 1933.
Basis of cost data:
Effective Man Day - $6.00
Pound Chemical .09

The method of mop-up work in 1934 was determined by the conditions existing on each plot. The purpose was to use the most economical and efficient method of performing this mop-up work on areas that had received various chemical treatments in 1933.

On those areas where the clumps of Ribes bushes had been broken up by previous chemical treatment and a high percentage of the bushes killed, the surviving Ribes plants could be eradicated easily by hand. The killing of the secondary roots of these bushes as a result of the previous chemical treatment served to loosen the roots in the soil to such an extent as to make their eradication by hand very easy.

On those areas where the clumps of Ribes bushes had not been broken up sufficiently to change materially the original condition on the ground and the surviving Ribes bushes still retained a firm hold in the soil, the spraying method was used. The power spraying unit was used and a heavy application made on all surviving Ribes, especially to the root crowns where resprouting was taking place. All Atlacide plots, with the exception of plot No. 1A were hand pulled, the latter being retreated with chemical.

5. Special experiment treating an R. inerme area with an ammonium thiocyanate solution to prepare the area for burning Ribes and brush in place. See table No. 5.

TABLE NO. 5

SPECIAL EXPERIMENT TREATING RIBES INERME AREA WITH AMMONIUM THIOCYANATE TO PREPARE AREA FOR BURNING RIBES AND BRUSH IN PLACE

No. Acres	No. Man Days	Pounds of Ammonium thiocyanate	Gallons of Water	Data on Per Acre Basis			
				Man Days	Pounds Chemical	Gallons Solution	Cost
4.5	30	12,000	6,000	6.7	2,666	1,333	$280.14

Treatment made 1934.
$6.00 per man day.
.09 per pound of chemical.

This experiment was conducted on Elk Creek on the St. Joe National Forest. The purpose of this experiment was to attempt to kill all vegetative growth in place for burning the following year.

If the experiment is successful, the value of the method lies in the fact that no maintenance or mop-up work will be necessary on the area. This will be accomplished in the event that the burning is sufficient to destroy all the existing Ribes and any Ribes seed present in the soil. Since the burning has not been done, the final results are not known.

There are some important facts involved in this method which tend to make it impractical as a standard method. The initial cost involved in chemical and

The method of mop-up work in 1934 was determined by the conditions existing on each plot. The purpose was to use the most economical and efficient method of performing this mop-up work on areas that had received various chemical treatments in 1933.

On those areas where the clumps of Ribes [illegible] previous chemical treatment and a high percentage of the [illegible] living Ribes plants could be eradicated easily by hand. [illegible] secondary roots of these bushes as a result of the [illegible] served to loosen the roots in the soil to such an extent [illegible] tion by hand very easy.

On those areas where the clumps of Ribes bushes had not [illegible] sufficiently to change materially the original condition on the [illegible] surviving Ribes bushes still retained a firm hold in the soil, the smearing method was used. The power spraying unit was used and a heavy application made on all surviving Ribes, especially to the root crowns where resprouting was [illegible] All Adirondack plots, with the exception of plot No. 14 were hand pulled, [illegible] being retreated with chemical.

5. Special experiment treating an A. inermis area with an ammonium thiocyanate solution to prepare the area for burning Ribes and brush in place. See table No. 5.

TABLE NO. 5

SPECIAL EXPERIMENT TREATING [illegible] INERMIS
[illegible]
FOR BURNING RIBES AND BRUSH [illegible]

No. Acres	[illegible] Ammonium thiocyanate	Pounds of	Data on Per Acre Basis			
		Gallons	Man Pounds		Gallons	
[illegible]	[illegible]	6,000	8.7	2,666	1,322	$250.14

Treatment made 1934.
$6.00 per man day.
.09 per pound of chemical.

This experiment was conducted on Mt Green on the St. Joe National Forest. The purpose of this experiment was to attempt to kill all vegetative growth in place for burning the following year.

If the experiment is successful [illegible] on the area. Since the fact that no maintenance or mop-up work [illegible] necessary be accomplished in the event that the burning is sufficient to destroy all the existing Ribes and any Ribes seed present in the soil. Since the burning has not been done, the final results are not known.

There are some important facts involved in this method which tend to make it impractical as a standard method. The initial cost involved in chemical and

labor is much greater than the cost of bulldozer work which accomplishes practically the same results expected from this experiment. There is some question, also, as to whether the burning will be sufficiently intense to accomplish the objective. The latter is a very important consideration since, on account of the fire hazard in relation to surrounding timbered areas, it will not be possible to burn the brush at a time when practical results might be obtained.

CONCLUSION

The results of each experiment have been discussed in the body of the report. There are certain conclusions, however, which may prove to be of value in planning future control work.

1. Eradicating R. petiolare

Atlacide is far superior to ammonium thiocyanate in the eradication of R. petiolare.

Late season spraying with Atlacide can be made effective by making ground applications at the rate of 1/10 gallon per square foot, using 1.4 to 2 pounds of Atlacide per gallon depending on the moisture conditions in the soil.

2. Eradicating R. inerme and R. lacustre in stream type.

Where hand pulling methods are not adequate for eradicating heavy concentrations of R. inerme and R. lacustre in stream type, bulldozer or slashing methods are recommended on the basis of costs and efficiency in preference to chemical methods.

Satisfactory results cannot be obtained with chemical methods without the application of 600 to 1,000 pounds of Atlacide or ammonium thiocyanate per acre (2,000 pounds per acre for area actually covered with Ribes.) A considerable amount of reworking is necessary the following year, either by hand pulling methods or spraying methods. The cost of this chemical plus the labor costs to apply it is considerably greater than in the case of the bulldozer or slashing costs. The problem of eradicating Ribes seedlings which appear on sprayed areas is much greater than in the case of the areas cleared by the bulldozer or by slashing. In the case of the latter two methods, the brush has been removed and the reworking of the area is much easier than in the case of the sprayed areas.

CONCLUSION

The results of the experiment here described in the body of this report. There are certain conclusions, however, which may prove to be of value in planning future control work.

1. Spraying versus dusting

Although it is possible to destroy [illegible] by [illegible] petiolare.

Late season spraying with Atlacide can be made effective by reducing pounds of Atlacide per gallon depending on the moisture conditions [illegible] spread applications at the rate of [illegible] per acre.

2. Spraying [illegible] and [illegible]

Where hand pulling methods are not adequate for eradicating heavy concentrations of [illegible] and [illegible] in stream type. [illegible] methods are recommended on the basis of costs and [illegible] chemical methods.

Satisfactory results cannot be obtained with chemical methods without the application of 200 to 1,000 pounds of [illegible] per acre (2,000 pounds per acre for [illegible]) depending on amount of [illegible] to be destroyed. Either by hand pulling or by spraying methods. The use of this chemical [illegible] is considerably greater than it. The cost of the [illegible] problem of eradicating [illegible] the case of the latter two methods, the brush has been removed and the reworking of the area is much easier than in the case of the sprayed areas.

fire hazard in relation to surrounding timbered areas, it will not be possible to burn the brush at a time when practical results might be obtained.

objective. The latter is a very important consideration since, on account of the-

RIBES ERADICATION BY BULLDOZER METHOD

By
John F. Breakey
Agent

INTRODUCTION

Ribes eradication in stream type by the bulldozer method was first started in the Northwest at Savenac Nursery, Haugan, Montana, in 1929. This method of Ribes eradication was developed further in 1932 at Clarkia, Idaho on the East Fork of St. Maries River and also on the Coeur d'Alene National Forest on the North Fork of Coeur d'Alene River. Seventy acres were cleared in 1932. During 1933 a total of 158 acres of stream type brush and Ribes on the Coeur-d'Alene National Forest was cleared by the machine method. A total of 51 acres was burned and planted to trees or grass.

A total of 393 acres was worked by the bulldozer method in 1934, 243 acres on the Kaniksu National Forest and 150 acres on the Coeur d'Alene National Forest. On the Coeur d'Alene National Forest this work was performed on Tepee Creek and its tributaries, Big Elk Creek, Little Elk Creek, Short Creek and Halsey Creek. On the Kaniksu National Forest the work was done on East River, Lower West Branch and tributaries including Tunnel Creek and Flat Creek, the West Fork of Moore Creek, Kalispell Creek, Reeder Creek and Goose Creek.

DESCRIPTION OF EQUIPMENT

Prior to 1933, this bulldozer method was in the experimental stage and rented machines were used. The Caterpillar-50 tractor, rigged with master bulldozer equipment and a brush rake made up from special drawings furnished by the Division of Plant Disease Control, which was used on the Coeur d'Alene National Forest in 1933, was used on this same forest in 1934. An R-5 Caterpillar tractor was purchased for use on the Kaniksu National Forest and rigged with Isaacson Iron Works bulldozer equipment and a brush rake built by Isaacson from blue prints furnished by the Division of Plant Disease Control. Special pump guards, cylinder guards and valve shields were put on the machine before it was placed in the field. The R-5 tractor came equipped with 24-inch angle-iron track shoes, but they proved to be unsatisfactory as they bent out of shape and loosened upon the bolts causing a great deal of lost machine time. This track assembly was replaced with 20-inch grouser-equipped, steel, heat-treated shoes.

The principal differences between the Caterpillar-50 and the R-5 Caterpillar are in the weight and width of machine. The gross weight of the Caterpillar-50 fully equipped is 11-1/2 tons, and the fully equipped R-5 Caterpillar weighs 9-1/2 tons. The horse power of each is about equal. On the Caterpillar-50 the digging teeth, ten in number, are spaced 10-3/4 inches apart, and the total width of the brush rake is 8 feet, 5-1/2 inches. There are 10 teeth on the R-5 spaced 12-5/8 inches apart, and the total width of the machine is 9 feet 7-5/8 inches. The track width on the Caterpillar-50 is 18 inches.

The light weight tractor is more flexible than the heavier machine. The movement of the light machine over soft ground was more rapid and the ground clearing time was lessened a comparable amount. More drawbar power made it possible to increase the clearing speed.

[illegible]

[illegible]
Agent

INTRODUCTION

[illegible] was burned and planted to trees or grass.

A total of 382 acres was worked by the caterpillar tractor on the Indian National Forest and 150 acres on the Coeur d'Alene National Forest. On the Coeur d'Alene National Forest this work was performed on Eagle Creek and its tributaries, Big Elk Creek, Little Elk Creek, Shoe Creek, Daisy Creek. On the Kaniksu National Forest the work was done on West Fork of Moore Creek, Hallowell Creek, Swamp Creek and Lower West Fork and tributaries including Pickhandle Creek.

DESCRIPTION OF EQUIPMENT

Prior to 1924, this machinery method was in the experimental stage and machines were used. The Caterpillar-60 tractor, rigged with bulldozer equipment and a brush rake made by Iron Horse Manufacturing Company, was used on the Coeur d'Alene National Forest in 1923, was used on this same forest in 1924. The Caterpillar tractor was purchased for use on the Kaniksu National Forest and rigged with Iron Horse bulldozer equipment and a brush rake built by Pinehurst Shop private farmers by the Division of Plant Disease Control. Special [illegible] cylinder guards and valve shields were put on the machine before it was placed in the field. The R-6 tractor came equipped with [illegible] but they proved to be unsatisfactory so they were taken off and [illegible] the bolts causing a great deal of lost motion time. This trouble probably was replaced with 12-inch grouser-equipped, steel-faced shoes.

The principal differences between the Caterpillar-60 and the R-6 Caterpillar are in the weight and width of machine. The gross weight of the Caterpillar-60 fully equipped is 11-1/2 tons. The horse power of each is about equal. On the Caterpillar-60 the digging teeth, ten in number, dig [illegible] inches, and the total width of the brush rake is 6 feet. The R-6 weighs 9-1/2 tons. The total width of the brush rake is 6 feet. The R-6 spaced 12-3/0 inches apart, and the total width of the machine is 8 feet 7-5/8 inches. The track width on the Caterpillar-60 is 16 inches.

The light weight tractor is more flexible than the heavier machine. The steepest of the light machine over soft ground was nearly [illegible] and the ground clearing time was reduced a considerable amount. More crawler power made it possible to increase the clearing speed.



W-1478. R-5. Caterpillar tractor equipped with Isaacson Iron Works bulldozer assembly and special brush rake. This machine was used on the Kaniksu National Forest for Ribes eradication work.



W-1557. Area worked by bulldozer method showing brush and Ribes piled in windrows.

METHODS OF WORK

Each bulldozer crew consisted of a camp boss, one straw boss, one powderman, two or three bulldozer drivers, two or three bulldozer pilots, and three laborers. Each bulldozer driver, assisted by a pilot, worked an eight-hour shift five days each week. Driving time ranged from 3:45 A.M. to 8:15 P.M. The work periods were so arranged that the machine was operated continuously during the entire day. Three drivers and three pilots were used when operating the machine seven days each week, and two drivers and two pilots were employed when working the machine on a five-day week plan. Three laborers were employed to trim around the windrows and brush piles in order to make the piles more compact and suitable for burning. These men also assisted in moving camp.

All areas designated for bulldozer work were drained prior to clearing by machine. Working two or three weeks ahead of the crew, a powderman was sent in to blow out all beaver dams. In some cases these dams were rebuilt and it was necessary to blow them out again the following day.

Before any clearing work was done it was the duty of the ground pilot to scout the area thoroughly in order to determine the location of heavy brush, water, beaver runs and unsafe ground and to plan from this information the proper location for windrows and brush piles. When the machine was operating, the pilot was responsible for directing the operator as to where the brush piles were to be placed, the direction in which the machine was to be driven, the depth at which to place the digging teeth, and pointing out the location of ditches, water holes, large rocks or any other hazard which might cause delay.

General instructions given to the crews were: to make compact piles of brush and Ribes as free from dirt as possible, to clear brush away from streams whenever possible leaving a narrow row of standing brush on the banks, when feasible to work on two or more windrows of brush at the same setting thus cutting down the back-trailing time of the machine, and to slash down overhanging brush taking care to close in all openings in windrows in order to insure a complete burn. Crews were instructed to leave no standing trees in the windrows, to have a fire break surrounding each area cleared by the machine and to move all combustible material either into piles or a safe distance away from the material to be burned.

As the final step in land clearing, the brush piles and windrows are burned. It is understood by each camp boss that the burning of the brush is not within the scope of his duties. The responsibility for these burning operations is vested in the local Forest Service ranger or local representative of the fire protection organization.

The cleared areas were seeded to grass in an attempt to effect the permanent suppression of Ribes. In 1934 all grass seeding was done during the month of October with a broadcast seeder.

METHODS OF WORK



W-1543. Area showing density of brush in stream bottom. Many Ribes are present.



W-1556. Area worked by bulldozer method. Brush windrows burned under Forest Service supervision. Area planted to grass following burning.

TABLE NO. 1

RIBES ERADICATION BY THE BULLDOZER METHOD 1934

Forest	Acres	Total Man Days	Man Days Repairing Machine	Machine Hours	No. Days Machine in Service	Average per Acre		Average per Day	
						Man Days	Machine Hours	Acres	Machine Hours
Coeur d'Alene	150	779	139	1,040	132	5.20	6.93	1.14	7.9
Kaniksu	243	1,035	97	1,253	114	4.25	5.12	2.13	11.0
All Forests	393	1,814	236	2,293	246	4.61	5.83	1.60	9.3

TABLE NO. 2

RIBES ERADICATION BY THE BULLDOZER METHOD
KANIKSU NATIONAL FOREST 1934

Area	Working Unit	Acres	Man Days	Machine Hours	Machine Hours per Acre
East River	1	79	517	552	7.00
Lower West Branch	7	9	29	44	5.00
Tunnell Creek	7	8	29	40	5.00
Lower West Branch	7	19	38	82	4.30
Flat Creek	7	32	77	110	3.40
West Fork Moore Creek	7	21	68	80	3.80
Kalispell Creek	5	67	239	300	4.50
Goose Creek	6	8	38	45	5.60
All Areas		243	1,035	1,253	5.12

TABLE NO. 1

RIBBS TRANSLOCATION BY THE BULLDOZER, MAY 3, 1954

Forest	Acres	Total Time Used Hours	Per Hour Operating Machine	Number Dozers	No. Days Worked in Service	Average per Day Hrs.	Hours	Average Cut Per Day
Coeur d'Alene	150	779	139	1,040	139	5.20	6.6	1.11
Kenikan	243	1,056	87	1,364	114	[illegible]	[illegible]	[illegible]
All Forests	397	1,814	226	2,404	249	4.07	[illegible]	[illegible]

TABLE NO. 2

RIBBS TRANSLOCATION BY THE BULLDOZER METHOD
KANIKSU NATIONAL FOREST, 1954

Area	Working Units	Acres	Man Days	Machine Hours	Machine Hours per Acre
East Side	1	150	139	779	5.20
Lower East Branch	2	[illegible]	[illegible]	[illegible]	[illegible]
Tunnell Creek	2	8	16	80	10.00
Lower West Branch	2	12	28	154	12.83
Flat Creek	2	[illegible]	22	112	7.46
West Fork Moore Creek	2	[illegible]	6	32	5.33
Fishtrap Creek	2	27	16	108	4.00
Goose Creek	2	7	11	60	8.57
All Areas		243	1,056	1,364	5.61

TABLE NO. 3

RIBES ERADICATION COST BY BULLDOZER METHOD

National Forest	Clearing Operation				Burning		Cost Per Acre		
	No. Acres	Expenditures	Machine Depreciation	Total Cost	No. Acres	Cost	Clearing	Burning	Total
Kaniksu	243	$ 8,790.74	$1,660.22*	$10,450.96	189.6	$1,516.72	$43.01	$8.00	$51.01
Coeur d'Alene	150	6,210.93	1,300.00**	7,510.93	150.0	835.53	50.07	5.57	55.64
All Forests	393	$15,001.67	$2,960.22	$17,961.89	339.6	$2,352.25	$45.70	$6.93	$52.63

*One-third cost of new equipment.
**Depreciation charged at $1.25 per running hour.

Cost of R-5 caterpillar and bulldozer equipment used on the Kaniksu National Forest:

Tractor complete with bulldozer and brush rake	$4,623.35
Installation of bumper, hoist and pump guard	200.00
Set of heat-treated track shoes	135.25
Headlights and fitting	22.05
Total	$4,980.65

TABLE NO. 4

RECORD OF GASOLINE AND OIL CONSUMPTION

National Forest	Machine Running Hours	Gasoline (Gallons)		Lubrication			
				Oil (Gallons)		Grease (Pounds)	
		Tractor	Per Hour	Motor	Hoist	Track and Transmission	Alemite
Kaniksu	1,253	4,227	3.37	129	171	825	136
Coeur d'Alene	1,040	3,931	3.78	163	97	922	97
All Forests	2,293	8,158	3.55	292	268	1,747	233

TABLE NO. 3

ELECTRIC DEPRECIATION COST BY SUBACCOUNT CLASS

| Depreciation Cost | | |

TABLE NO. 5

GRASS SEED SOWN ON CLEARED AREAS
COEUR D'ALENE NATIONAL FOREST - 1934

Location	Acres	Total Pounds of Grass Seed	Pounds of Grass Seed per Acre								
			Canary Grass	Kentucky Blue Grass	Timothy	Red-top	Broom Grass	Orchard Grass	Alsike Clover	Meadow Fescue	Total
Tepee Creek, Three Forks to Magee R. S.				3	3	1	1	1	1		10
Tepee Creek, Three Forks to Y Creek	94.4	944		3	4		1	1		1	10
Big Elk Creek	43.3	520	2	3	3	1	1	1	1		12
Little Elk Creek	9.0	90		3	3	1	1	1	1		10
Picnic Creek Area	25.0	250		3	3	1	1½	1½			10
Horseheaven R.S. Area	55.0	550		3	3	1	1	1	1		10
All Areas	226.7	2,354									

TABLE NO. 6

GRASS SEED SOWN ON CLEARED AREAS
KANIKSU NATIONAL FOREST - 1934

Location	Acres	Total Pounds Grass Seed	Kentucky Blue Grass	Timothy	Pounds Per Acre	Remarks
East River	80	800	600	200	10	Seeded in October by Forest Service
Lower West Branch	10	100	75	25	10	" " " " " "
Tunnel Creek	8	80	60	20	10	Seed given owner to sow.
Lower West Branch	20	200	150	50	10	" " " " "
Flat Creek	25	250	175	75	10	" " " " "
Kalispell Creek	32	320	240	80	10	" " " " "
All Areas	175	1,750	1,300	450	10	

The West Fork of Moore Creek and Goose Creek areas were not seeded.

TABLE NO. 5

CROSS SECTION OF CULVERTS AREAS

CUBIC FEET/SECOND - 100 YEAR

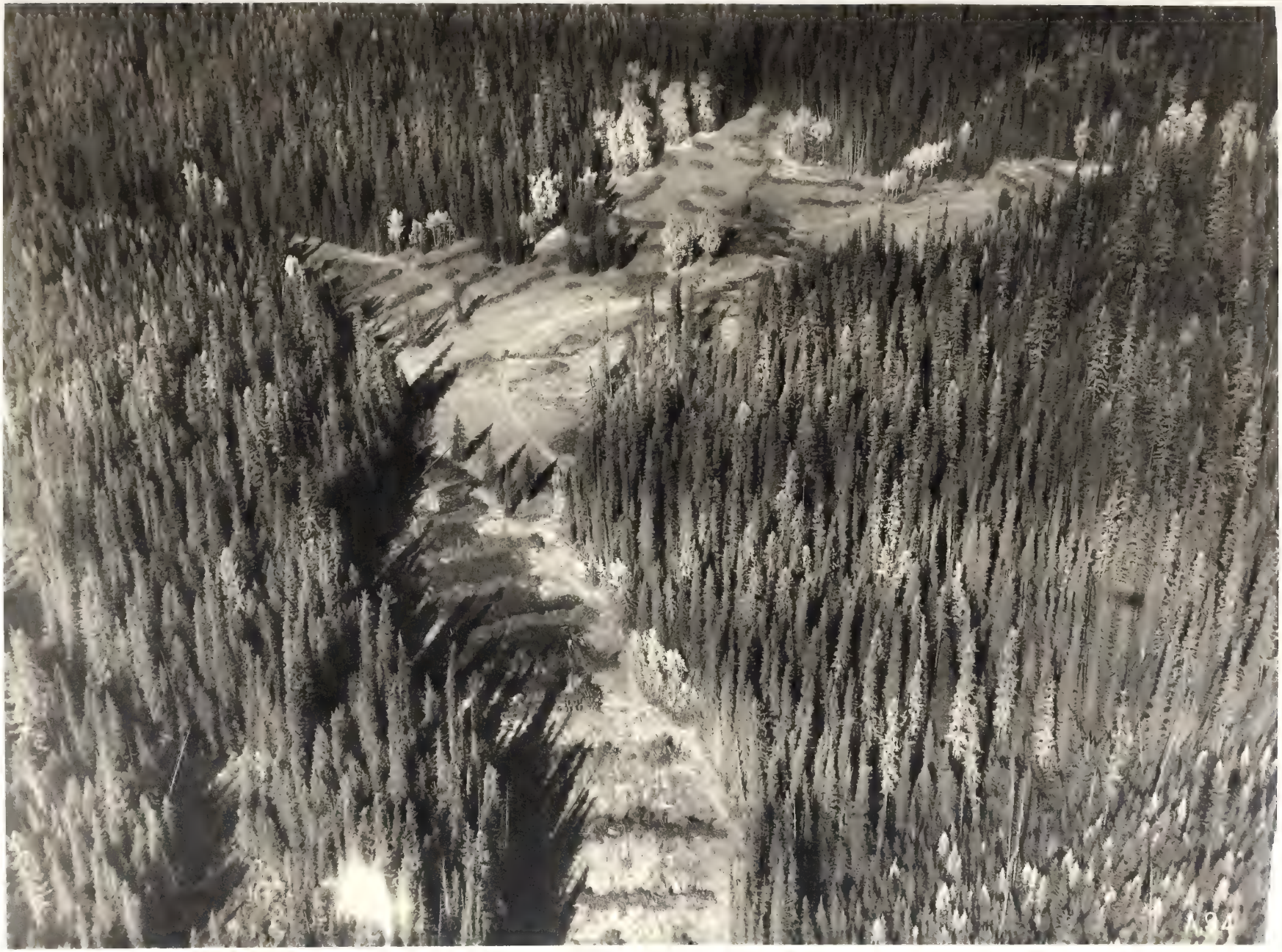
Location	Total Drainage Area (Acres)	Country Estate	Kentucky Blue Grass	Cleared Pasture	Med-ium Dept.	Brook Dept.	Orchard Dept.	Alfalfa Dept.	Clover Dept.	Meadow Dept.	Pecan Dept.
Above Creek, Above Route 1 to Above Dr.	1.5		1.5						1		10
Above Creek, Above Route 1 to Above Dr.	3.0		3						1		10
Above Creek, Above Route 1 to Above Dr.	4.4		3	1					1		10
Above Creek, Above Route 1 to Above Dr.	5.0		3	2					1		10
Above Creek, Above Route 1 to Above Dr.	5.5		3	2					1		10
Above Creek, Above Route 1 to Above Dr.	6.0		3	3					1		10
Above Creek, Above Route 1 to Above Dr.	6.5		3	3					1		10
Above Creek, Above Route 1 to Above Dr.	7.0		3	4					1		10
Above Creek, Above Route 1 to Above Dr.	7.5		3	4					1		10
Above Creek, Above Route 1 to Above Dr.	8.0		3	5					1		10
Above Creek, Above Route 1 to Above Dr.	8.5		3	5					1		10
Above Creek, Above Route 1 to Above Dr.	9.0		3	6					1		10
Above Creek, Above Route 1 to Above Dr.	9.5		3	6					1		10
Above Creek, Above Route 1 to Above Dr.	10.0		3	7					1		10

TABLE NO. 6

CROSS SECTION OF CULVERTS AREAS

CUBIC FEET/SECOND - 100 YEAR

Location	Total Drainage Area (Acres)	Country Estate	Kentucky Blue Grass	Cleared Pasture	Med-ium Dept.	Brook Dept.	Orchard Dept.	Alfalfa Dept.	Clover Dept.	Meadow Dept.	Pecan Dept.
Above Creek, Above Route 1 to Above Dr.	1.5		1.5						1		10
Above Creek, Above Route 1 to Above Dr.	3.0		3						1		10
Above Creek, Above Route 1 to Above Dr.	4.4		3	1					1		10
Above Creek, Above Route 1 to Above Dr.	5.0		3	2					1		10
Above Creek, Above Route 1 to Above Dr.	5.5		3	2					1		10
Above Creek, Above Route 1 to Above Dr.	6.0		3	3					1		10
Above Creek, Above Route 1 to Above Dr.	6.5		3	3					1		10
Above Creek, Above Route 1 to Above Dr.	7.0		3	4					1		10
Above Creek, Above Route 1 to Above Dr.	7.5		3	4					1		10
Above Creek, Above Route 1 to Above Dr.	8.0		3	5					1		10
Above Creek, Above Route 1 to Above Dr.	8.5		3	5					1		10
Above Creek, Above Route 1 to Above Dr.	9.0		3	6					1		10
Above Creek, Above Route 1 to Above Dr.	9.5		3	6					1		10
Above Creek, Above Route 1 to Above Dr.	10.0		3	7					1		10



A-94. Aerial view showing 18 acres of land cleared by the bulldozer method. Official photograph, 116th Photo Section, W.N.G.

CONCLUSION

The two camp bosses and members of the crew were relatively inexperienced in this type of work. Mistakes were made at the outset which contributed to a higher per acre cost. Some mistakes resulted in time loss for repairs. There was a tendency at the start of the season to stress certain phases of the work to the neglect of other important points.

Men in charge of the bulldozer work should have considerable knowledge and experience in the handling and repair of tractor machinery along with the ability to plan and direct the actual clearing work. The machine pilots should be capable, experienced eradication men, preferably with some experience in brush burning.

A working schedule for the clearing of the various areas should be prepared in advance in order that the man in charge of the bulldozer work can arrange for the necessary work, such as draining the area, preparatory to the actual clearing operation.

Improvement in methods of clearing land by machine will include the following:

1. Piling brush in windrows whenever possible, and avoiding the use of the round type of brush pile.

2. Draining areas sufficiently in advance of the clearing operation to permit the run off of all standing water and the drying of the ground.

3. Proper training of ground pilots and machine drivers, the training to include illustrations of burning methods used by the Forest Service.

Conclusion

The two camp bosses and members of the crew were relatively inexperienced in this type of work. Mistakes were made at the outset which [illegible] higher per acre cost. Some mistakes resulted in time loss [illegible] a tendency at the start of the season to stress certain phases of the work to the neglect of other important points.

Men in charge of the bulldozer work should have considerable knowledge and experience in the handling and [illegible] ability to plan and direct the actual clearing work. [illegible] capable, experienced woodsman, preferably [illegible] burning.

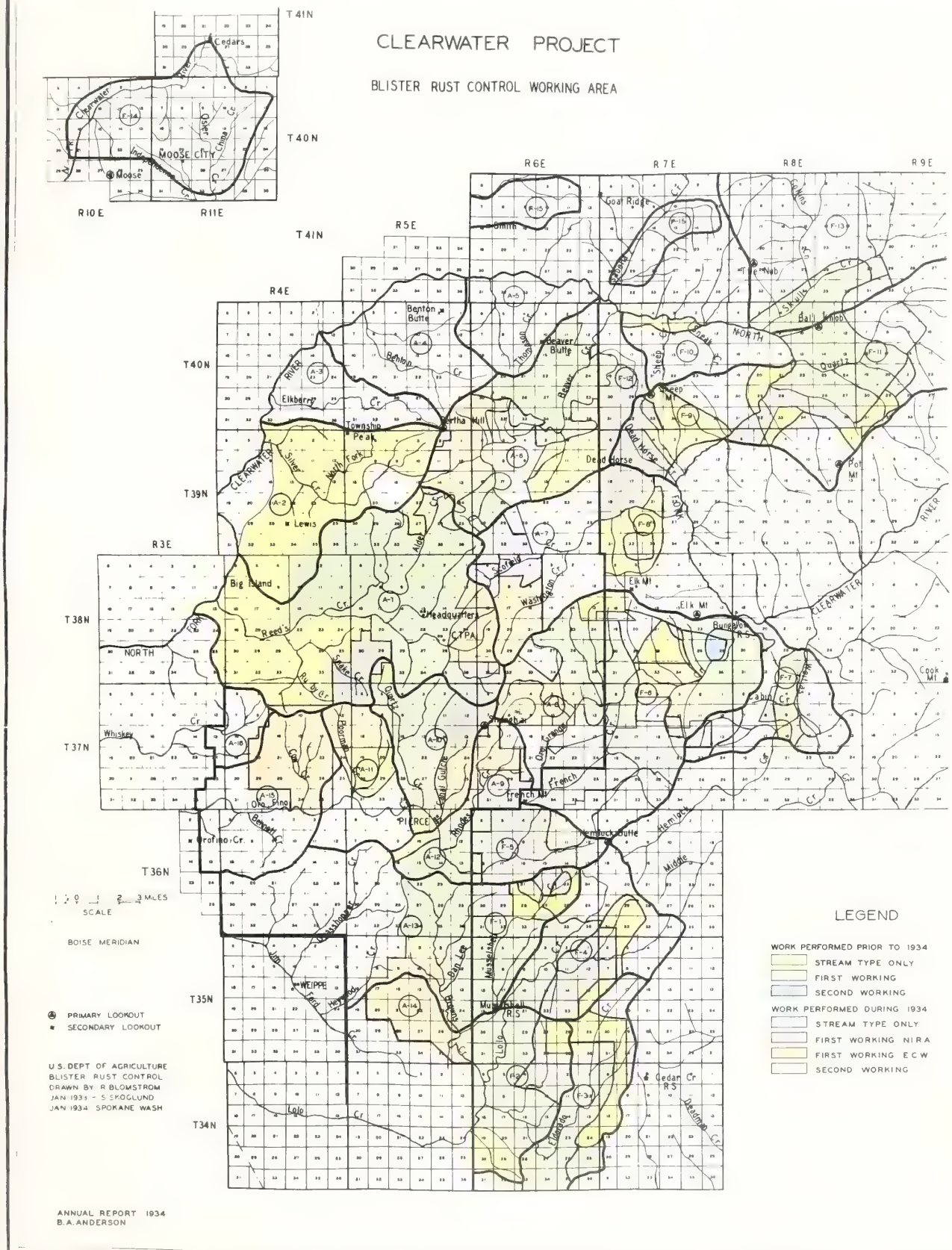
A working schedule for the clearing of the various areas should be prepared in advance in order that the men in charge of the [illegible] for the necessary work, such as draining the area, preparatory to the actual clearing operation.

Improvement in methods of clearing land by machine will include the following:

1. Piling brush in windrows whenever possible, and avoiding the use of round type of brush pile.

2. Draining areas sufficiently in advance of the clearing operation to permit the run off of all standing water and the drying of the ground.

3. Proper training of ground pilots and machine drivers, the training to include illustrations of burning methods used by the Forest Service.


CLEARWATER PROJECT
BLISTER RUST CONTROL WORKING AREA
T41N
T40N
T39N
T38N
T37N
T36N
T35N
T34N
R10E
R11E
R4E
R5E
R6E
R7E
R8E
R9E
R3E
Cedars
Moose
MOOSE CITY
Benton Butte
Beaver Butte
Goat Ridge
Bald Knob
Elkberry
Township Peak
Martha Mill
Dead Horse
Sheep Mt
Elk Mt
Big Island
Headquarters
CTPA
Lewis
Pierce
Hemlock Butte
French Mt
Cook Mt
Weippe
Musselshell RS
Cedar Cr RS
Orofino Cr
Whiskey
NORTH
FORK
CLEARWATER
RIVER
SCALE
BOISE MERIDIAN
PRIMARY LOOKOUT
SECONDARY LOOKOUT
U.S. DEPT OF AGRICULTURE
BLISTER RUST CONTROL
DRAWN BY R BLOMSTROM
JAN 1933 - S SKOGLUND
JAN 1934 SPOKANE WASH
LEGEND
WORK PERFORMED PRIOR TO 1934
STREAM TYPE ONLY
FIRST WORKING
SECOND WORKING
WORK PERFORMED DURING 1934
STREAM TYPE ONLY
FIRST WORKING NIRA
FIRST WORKING E C W
SECOND WORKING
ANNUAL REPORT 1934
B.A. ANDERSON

RIBES ERADICATION, CLEARWATER PROJECT, 1934

By
B. A. Anderson, Associate Forester
Division of Plant Disease Control
and
Paul H. Gerrard, Assistant Supervisor
Forest Service

INTRODUCTION

The Clearwater project includes the white pine blister rust control work on the lands of the Clearwater National Forest and the Clearwater Timber Protective Association.

As the blister rust control program is now outlined for the Clearwater project, the local control area includes 530,297 acres of white pine type. Of this acreage at the advent of the 1934 field season initial Ribes eradication had been done on 136,949 acres of upland types and 35,185 acres of stream type. Second eradication work had been completed on 7,802 acres of the initial stream type worked.

All work on the Clearwater project during 1934 was financed through ECW and NIRA funds. At the close of the 1934 season it is estimated that 60 percent of all initial Ribes eradication work on the Clearwater Timber Protective Association lands and 66 percent on the Clearwater National Forest had been completed.

LOCATION AND DESCRIPTION OF AREAS

Working plans for the Clearwater National Forest called for the completion of all initial Ribes eradication on working units F-1 to F-13 inclusive. On those areas where initial stream type work only had been done previously it was planned to mop up the stream type. Camps located on the Clearwater Timber Protective Association lands were scheduled to work areas adjacent to Forest Service lands. However, forest fires interfered seriously with these plans.

Extremely heavy work was encountered on the head of Musselshell Creek in working unit F-1. Fifty percent of the work was in open reproduction supporting more than 1,200 Ribes per acre. With the exception of the area at the head of Mud Creek, initial eradication was completed in working units F-2, F-4 and F-5. About 62 percent and 22 percent of the area in these units was open mature and open reproduction, with an average Ribes population of 71 and 227 Ribes per acre respectively.

The bulk of the work in working unit F-6 was done on open mature and pole areas. Although the worked areas are well blocked there still remain several thousand acres of initial upland work to be done on this unit. The heavy concentrations of brush and *Ribes inerme* above Cache Creek on Orogrande

By

B. A. Anderson, Associate Forester
Division of Plant Disease Control

and

Paul E. Gerrard, Assistant Supervisor

INTRODUCTION

The Clearwater project involves the white pine blister rust control on the lands of the Clearwater National Forest and the Clearwater Timber Protective Association.

As the blister rust control program is now outlined for the Clearwater project, the local control area includes [illegible] of which this acreage at the advent of the 1934 field season initial Ribes eradication had been done on 136,949 acres of upland types and 25,180 acres of stream type. Second eradication work had been completed on 7,802 acres of upland type work.

All work on the Clearwater project during 1934 was financed through ECW and NIRA funds. At the close of the 1934 season it is estimated that 80 percent of all initial Ribes eradication work on the Clearwater Timber Protective Association lands and 66 percent on the Clearwater National Forest had been completed.

LOCATION AND DESCRIPTION OF AREAS

Working plans for the Clearwater National Forest called for the completion of all initial Ribes eradication on working units P-1 to P-12 inclusive. On those areas where initial stream type work only had been done previously it was planned to mop up the stream type. Camps located on the Clearwater Timber Protective Association lands were scheduled to work areas adjacent to Forest public lands. [illegible] with these plans.

Extremely heavy work was encountered on the head of Musselshell Creek in working unit P-1. Fifty percent of the work was in open reproduction supporting more than 1,500 Ribes per acre. With the exception of the area at the head of the Creek, initial [illegible] was completed in working units P-2, P-4 and P-5. About 62 percent and 22 percent of the area in these units was open reproduction, with an average Ribes population of 71 and 207 Ribes per acre respectively.

The bulk of the work in working unit P-6 was done on open mature and pole stand. Although [illegible] are well blocked [illegible] several thousand acres of initial upland work to be done on this unit. The heavy [illegible] of Ribes [illegible] above [illegible]

Creek necessitated a slashing operation.

Heavy concentrations of Ribes were encountered in the fine white pine reproduction stands in working unit F-7 on Bighorn, Cabin, and Veitas Creeks. With the exception of a piece of work on Upper Larch Creek, initial eradication has been completed on all pine areas worthy of consideration. The extremely difficult eradication work influenced by such factors as dense Ribes population, steep slopes, heavy brush, windfalls and R. inerme concentrations have and will continue to make working unit F-7 a high cost protection area.

The large percentage of mature timber in working units F-8, F-9 and F-12 offered no particular eradication problems in these units. The Hell Creek burn in working unit F-12 supported an almost solid concentration of R. viscosissimum with pine averaging better than 2,000 per acre.

Fully 70 percent of the total number of effective man days used in working units F-11 and F-13 were expended on open reproduction areas which comprised about 50 percent of the areas covered.

In general, work on the State and private lands of the Clearwater Timber Protective Association was confined to areas adjacent to federal lands and blocked in with areas finished during the 1933 season.

A precheck showed that most of the upland acreage on the South Fork of Reed's Creek in working unit A-1 did not need working. The open reproduction on the head of Alder Creek and the old burn at the head of Deer Creek entailed a slow and difficult job of Ribes eradication.

Almost all of the work done in working unit A-6 was confined to reproduction and cut over types. Most of the area worked has been burned over and Ribes are very numerous.

Very little upland acreage was worked on Schofield Creek; an entire Civilian Conservation Corps camp spent practically the whole season cleaning up the heavy concentrations of R. petiolare on the streams. Chemical work on Washington Creek was much lighter.

The areas cleared of Ribes in working units A-8, A-9 and A-10 presented average working difficulties. In working units A-11, A-13, A-14, A-15 and A-16 much of the upland area is low in Ribes population and can be eliminated from crew work, while the stream type will require a thorough working.

ORGANIZATION AND ADMINISTRATION

An exceptionally mild winter made it possible to start the 1934 Ribes eradication field season a full month sooner than during any previous season. CCC companies arrived from April 16 to May 7. Four of the companies moved into camps constructed in 1933 and seven were located in new camp areas, necessitating the building of quarters.

Civil Conservation Camp operations.

Heavy concentrations of Ribes were encountered in the fine white pine reforestation planting in working Unit F-7 on Bloomer, [illegible] Fair Haven Section of a piece of work on Sugar Creek, which has been completed on all other areas. [illegible]

difficult eradication work influenced by such factors as dense [illegible] steep slopes, heavy brush, windfalls and R. japonica concentrations were [illegible] continue to make working unit X-7 a high cost project.

The large percentage of mature timber in working units T-8, T-9 and T-12 offered no particular eradication problems in these units. The Bull Creek burn in working unit T-12 supported an almost solid concentration of R. viscosissimum with pine averaging better than 8,000 per acre.

Fully 70 percent of the total number of effective man days used in working units T-11 and T-12 [illegible] comprised about 80 percent of the areas covered.

In general, work on the State and [illegible] Timber Protective Association was confined to [illegible] and blocked in with other [illegible].

A precheck showed that most of the upland acreage on the South York Family Creek in working unit X-1 [illegible] on the head of Alder Creek and the old burn at the head of Deer Creek notable a slow and difficult job of Ribes eradication.

Almost all of the work done in working unit X-6 was on [illegible] reproduction and cut over types. Most of the area worked has [illegible] and Ribes are very numerous.

Very little upland acreage was worked on Schofield Creek; an entire Civilian Conservation Corps camp spent practically the whole season clearing up the heavy concentrations of R. petiolare on the streams. Chemical work on Washington Creek was much lighter.

The areas cleared of Ribes in working units X-8, X-9 and X-10 X-15 and X-16 much of the upland area is low in Ribes [illegible] [illegible] [illegible] [illegible].

CHARACTER AND ADMINISTRATION

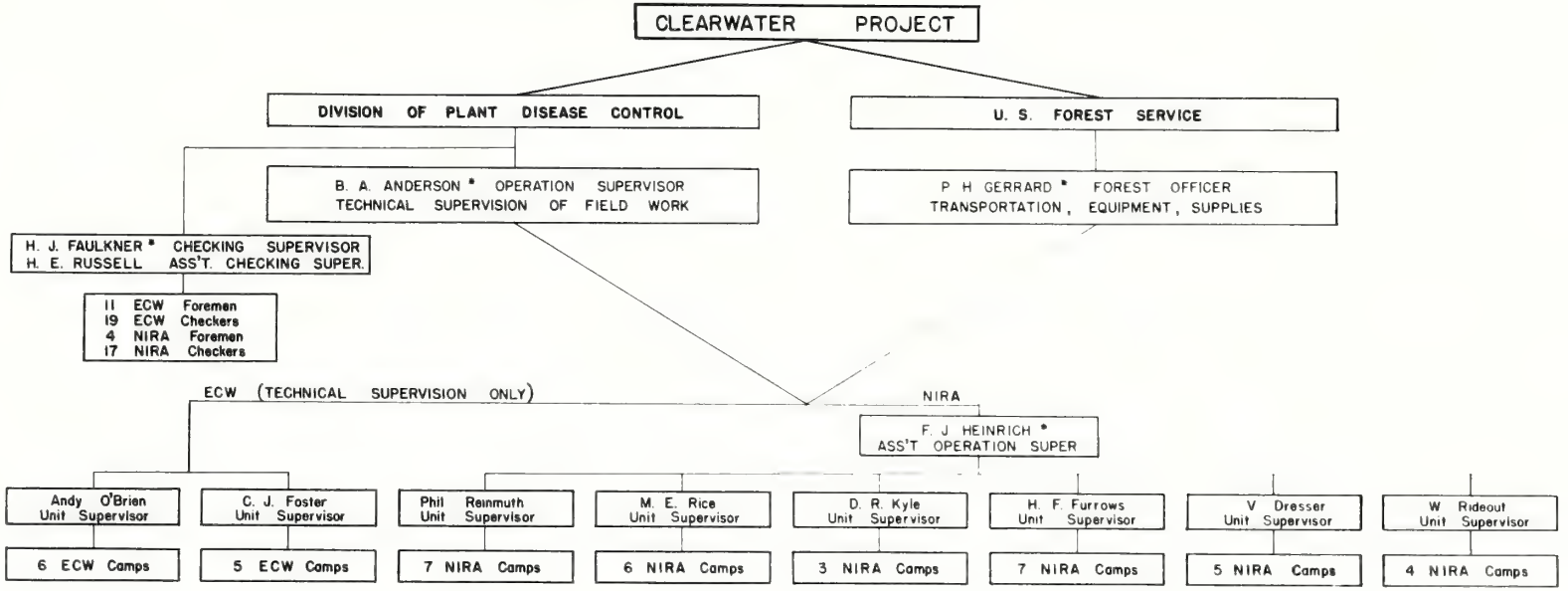
An exceptionally mild winter made it possible to start the [illegible] necessitating the building of quarters.

NIRA camps were moved into the field at the rate of one or two camps per day, the first camp starting field work April 29 and the last camp on May 21.

A cooperative agreement between the Bureau of Entomology and Plant Quarantine and the Forest Service provided for the transportation of equipment and supplies by the Forest Service for the seven 50-man NIRA camps financed by the Bureau of Entomology and Plant Quarantine. A central administrative and supply headquarters was maintained at Pierce, Idaho.



ORGANIZATION CHART



SIZE OF ECW ORGANIZATION

Number of Camps - 11

6 100 percent

4 80 percent

1 50 percent

Total number of men on blister rust work - 2038

SIZE OF NIRA ORGANIZATION

Number of 30-man Camps - 32

Total number of men on blister rust work - 1051

* Employed full year

WOW

Of the eleven CCC companies engaged in Ribes eradication, nine were enrolled in Illinois, one in Ohio and one was composed of Idaho men. In addition, each of the Illinois and Ohio companies contained a quota of local enrollees. All of the CCC companies arrived with a nucleus of men who had been in the Civilian Conservation Corps during two enrollment periods. These were replaced on July 1 with enrollees from the locality where the company had been originally enrolled.

Facilitating personnel for all CCC camps were for the most part Ribes eradication men who had previous experience in handling CCC enrollees.

Supervisory overhead, experienced laborers and all inexperienced laborers for NIRA camps were secured in so far as possible through the Reemployment office in Clearwater, Nezperce, Lewis and Idaho Counties.

The seriousness of the Pot Mountain and Selway fires necessitated the use of all NIRA and CCC men for fire fighting from August 1 to September 10. Field work was entirely disorganized and at the close of the fire season hundreds of experienced NIRA men did not return to the blister rust camps. It was necessary to close a number of the camps. The blister rust men who returned from the fire and about three hundred additional men recruited from the reemployment offices were assigned to the camps held open in order to complete the work on certain areas.

METHODS AND EQUIPMENT

Training schools for all supervisory personnel were held at the Musselshell Ranger Station from April 23 to May 4. In the CCW camps, instead of allowing each three or four-man crew to lay the string lines marking the boundary of the worked area, one man was assigned to each twenty to thirty men to lay strips marking the unworked area into crew strips. This practice resulted in more uniform crew lanes of maximum width in conformity with working conditions, in the keeping of string from being scattered along the trails and highways and in an appreciable saving in the amount of string used. Because of certain difficulties experienced in the use of this method it is questionable as to whether the method will become standard practice. It was not used except on an experimental basis in the NIRA camps where it did not show to advantage.

At the start of the season a mixture of 1.4# of Atlacide per gallon of spray was used in chemical work but due to the effective results secured in experimental work with lesser concentrations the mixture was cut down to one pound per gallon.

Chemical mop-up work on streams initially sprayed two to three years previous was much lighter than was expected. Every indication points to the conclusion that the removal of R. petiolare by the use of chemical (sodium chlorate or Atlacide) is practicable and assures permanent suppression of this species.

Much improvement was made in systematizing field maps and records. Adequate data are now being recorded to properly direct the rework program at a minimum of cost.

Of the eleven 000 companies engaged in fires surrounding, nine were enrolled in Illinois, one in Ohio and one was composed of Iowa men. In each of the Illinois and Ohio companies worked a quota of local enrollees. All of the 000 companies arrived with a nucleus of men who had been in the Civilian Conservation Corps ... with enrollees from the locality where the company had been originally enrolled.

Facilitating personnel for all 000 camps were for the most part fire eradication men who had previous experience in handling 000 enrollees.

Supervisory overhead, experienced laborers and all inexperienced laborers ... were trained ... in the ... office in Clearwater, Nezperce, Lewis and Idaho Counties.

The seriousness of the Pot Mountain and Selway fires necessitated the use of all NCA and 000 men for fire fighting from August 1 to September 1. Field work was entirely disorganized and at the close of the fire season experienced NCA men did not return to the Bitter root camps. It was necessary to close a number of the camps. The Bitter root men who returned from the ... were assigned to the camps held open in order to complete the work on certain areas.

Training ... Supervisory ...

Training schools for all supervisory personnel were held at the Musselshell Ranger Station from April 26 to May 4. In the NCA camps, lineups of all newly ... were ... the ... stripe marking the unworked area into crew strips. This practice resulted in ... the keeping of strips from being scattered along the trails and highways ... appreciable saving in the amount of stringing used. Because of certain ... experienced in the use of this method it is questionable as to whether the method will ... in the NCA camps where it did not show to advantage.

At the start of the season a mixture of 1.# of Atlantic per gallon of ... was used in chemical ... pound per gallon.

Chemical ... work on streams initially ... two to three years ... clusion that the removal of ... by the use of chemical (sodium ... or Atlantic) is practicable and assures ...

Much improvement was made in systematizing ... Adequate data are now being recorded to ... minimum of cost.

The heavy concentrations of *R. inerme* growing in the dense willow and alder brush along Orogrande Creek between the mouths of French and Cache Creeks necessitated a slashing operation. Following the slashing work the brush was burned and the stream bottom was sowed to a mixture of blue grass, timothy and redtop.

CHECKING

The checking work was conducted to give the eradication forces immediate and detailed information on the amount and distribution of Ribes on worked areas to insure an efficient job, to inspect certain areas prior to eradication work, to eliminate areas low in Ribes population from crew work, to secure permanent record maps showing graphically the amount and distribution of Ribes on control areas to facilitate the planning of future work, and to assist the eradication forces in organizing and conducting the eradication work.

A four percent sample check was made on worked areas by running parallel strips 13.2 feet in width at 5-chain intervals. Data necessary for the compiling of maps showing the amount and distribution of Ribes were recorded along each strip. The same method was used for checking in advance of crew work except that the width of strip was increased to 30 feet as a safety measure necessary before any area was eliminated from crew work.

In the ECW camps, 21 percent of the checker's time was spent on eradication activities. The remaining 79 percent was spent on regular checking activities. In NIRA camps six percent was spent on eradication and 94 percent on checking.

On the basis of the time spent on activities directly connected with the checking work, the cost per acre for checking in ECW camps was $.205 and $.189 in NIRA camps. The average checking cost over the entire area was $.197 per acre.

PREERADICATION

Toward the close of the Ribes eradication season preeradication work was done on white pine areas in the Schofield-Washington Creek drainage and the Weippe-Grangemont district. A total of 36,430 acres was covered, 28,930 acres by the compass strip method and 7,500 acres by the random scouting strip method. In the compass strip method four strips were run through each section. This season marked the completion of practically all preeradication work on white pine areas within the present control boundaries on the Clearwater project.

STATEMENT OF EXPENDITURES AND COSTS

Effective per-man-day costs are based on the expenditure of funds directly on NIRA work which appear in the NIRA column of table No. 2 and do not include the funds expended in cooperation with ECW. It was impossible to compute acreage and man-day costs on ECW work. ECW expenditures by the Forest Service and Division of Plant Disease Control represents principally supervisory and special equipment costs. No figures are available covering salaries, wages, subsistence, transportation, medical care, etc., of the enrollees.

The heavy concentrations of *P. ribicola* growing in the Lemhi Valley and along Drainage Creek between the months of March and June necessitated a clearing operation. Following the clearing work, brush was burned and the stream bottom was sowed to a mixture of alsike, timothy and redtop.

CHECKING

[illegible] date and detailed information on the amount and distribution of ribes [illegible] areas in terms of [illegible] work, to eliminate areas low in ribes population from crew work, to see permanent record maps showing graphically the amount and distribution of ribes on control areas to facilitate the planning of future work, and to assist the eradication forces in organizing and conducting [illegible] eradication work.

A four percent sample check was made on mapped areas by running parallel strips 16.5 feet in width at 5-chain intervals. Data necessary for the compiling of maps showing the amount and distribution of ribes were recorded along each strip. The same method was used for checking in advance of crew work except that the width of strip was increased [illegible] a safety measure necessary before any area was eliminated from [illegible]

In the [illegible] camps, 21 percent of the checker's time was spent on eradication activities. The remaining 79 percent was spent on regular checking activities. In [illegible] camps six percent was spent on [illegible]

On the basis of the time spent on activities directly connected with the checking work, the cost per acre for checking in [illegible] camps was $.209 and $.189 in [illegible] camps. The average checking cost over the entire area was $.197 per acre.

[illegible]

Toward the close of the ribes eradication season [illegible] work was done on white pine areas in the Bonnfield-Washington Creek drainage and the Weippe-Orangemont district. A total of 56,600 acres was covered, 38,000 acres by the compass strip method and 7,000 acres by the random [illegible] strip method. In the compass strip method four strips were run through each section. This season marked the completion of practically all [illegible] work on white pine areas within the present control boundaries on the Clearwater [illegible]

[illegible] OF [illegible] AND COSTS

Effective per-man-day costs are based on the expenditure of funds [illegible] on [illegible] include the funds expended in cooperation with [illegible]. It was impossible to compute acreage and man-day costs on [illegible] work. [illegible] expenditures by the Forest Service and Division of Plant Disease Control represents principally supervisory and special equipment costs. No figures are available covering salaries, wages, subsistence, transportation, medical care, etc., of the enrollees.

The loss of approximately 41 days during the field season when the entire blister rust organization was called on for fire duty due to the serious emergency represented by the Pot Mountain and Selway fires increased the effective man-day costs on blister rust work. This is accounted for in the loss in effective man-days due to fire and the charging against a greatly reduced number of effective man-days such fixed costs as overhead and equipment, the costs involved in training new men, in reorganizing transportation systems and in running camps at reduced strength.

TABLE NO. 1

EXPENDITURES BY APPROPRIATIONS

Cooperating Agency	Appropriation	Amount
Forest Service	Impnira	$316,605.24
	Lieunira	1,832.16
	S & E - R 1	1,166.80
	ECW	772.76
	Total	320,376.96
Bureau of Entomology & Plant Quarantine	Regular (B.P.I.)	1,740.54
	Nira - Idaho	74,045.69
	Total	75,786.23
Total Expenditures		$396,163.19

TABLE NO. 2

CLASSIFIED EXPENDITURES

Item	NIRA	Cooperation with ECW	Total
Salaries, Permanent Men	$ 7,711.07	$ 3,079.37	$ 10,790.44
Wages, Temporary Men	252,382.71	7,380.77	259,763.48
Subsistence Supplies	58,923.57		58,923.57
Equipment	23,289.18		23,289.18
Other Supplies	10,620.43		10,620.43
Transportation and Travel	32,324.64	451.45	32,776.09
Total Expenditures	385,251.60	10,911.59	396,163.19
Less 2/3 Cost of New Equipment	15,930.47		15,930.47
Plus 1/3 Cost of Old Equipment	8,597.00		8,597.00
Plus Cost of Supplies on Hand	870.56		870.56
Net Cost 1934 Operations	$378,788.69	$ 10,911.59	$389,700.28

Additional cost information:

1. Effective man-day cost - NIRA (Hand Eradication) $ 8.65
2. Effective man-day cost - NIRA (Chemical Eradication) 9.05
3. Food cost per man-day - NIRA 0.48
4. Pounds of Atlacide used-NIRA and ECW-255,000 Cost, 19,485.60
5. Pounds of twine used-NIRA and ECW- 23,879 Cost, 6,603.70

Additional cost information:

3. Food cost per man-day - MRA 0.48
4. Pounds of Atlacide used-MRA and MCA-256,000 Cost, 19,462.80
5. Pounds of twine used-MRA and MCW- 25,879 Cost, 6,606.70

SUMMARY OF RIBES ERADICATION 1934
CLEARWATER PROJECT

TABLE NO. 3

SUMMARY OF ALL WORKINGS

Name	Eradication Type	Acres First Working	Acres Second Working	Acres Third Working	Total Effective Man Days	Total Ribes	Gallons Spray	Total Cost
	Open Reproduction	5,838			11,428	1,721,138		
	Dense Reproduction	152			58	591		
	Open Pole	3,766			2,677	556,480		
	Dense Pole	435			445	79,863		
	Open Mature	35,299			14,567	2,672,320		
	Dense Mature	513			3	219		
ECW	Cut Over	6,583			9,929	3,429,084		
Camps	Burn	30			226	167,273		
	Meadow	456						
	All Upland	53,072			39,333	8,625,968		
	Stream (Hand)	3,796	1,291	297	7,017	1,113,285		
	Stream (Chemical)	1,344	263		5,808		145,192	
	Stream (Slash)	26			741			
	All Stream	3,796	1,291	297	13,566	1,113,285		
	All Types	56,868	1,291	297	52,899	9,739,253		
	Open Reproduction	9,750			17,175	7,504,109		$148,486.55
	Dense Reproduction	737			203	59,240		1,755.04
	Open Pole	9,118			4,747	1,304,499		41,040.21
	Dense Pole	1,387			185	55,663		1,599.42
	Open Mature	29,354			12,796	4,955,876		110,627.88
	Dense Mature	585			3	298		25.94
	Cut Over	112			216	249,928		1,867.42
NIRA	Selective Cut Over	752			297	385,839		2,567.72
Camps	Brush	561			397	134,961		3,432.27
	Burn	279			329	504,154		2,844.37
	Subalpine	122			118	53,948		1,020.17
	All Upland	52,757			36,466	15,208,515		315,266.99
	Stream (Hand)	1,384	3,390	914	4,982	962,136		43,071.91
	Stream (Chemical)	343	448	63	1,625		38,339	20,449.79
	All Stream	1,384	3,390	914	6,607	962,136		63,521.70
	All Types	54,141	3,390	914	43,073	16,170,651		$378,788.69
	Open Reproduction	15,588			22,603	9,225,247		
	Dense Reproduction	889			261	59,831		
	Open Pole	12,884			7,424	1,860,979		
	Dense Pole	1,822			630	134,526		
	Open Mature	64,653			27,363	7,628,196		
	Dense Mature	1,098			6	517		
ECW	Cut Over	6,695			10,145	3,679,012		
and	Selective Cut Over	752			297	385,839		
NIRA	Brush	561			397	134,961		
Camps	Burn	309			555	671,427		
	Subalpine	122			118	53,948		
	Meadow	456						
	All Upland	105,829			75,799	23,834,483		
	Stream (Hand)	5,180	4,681	1,211	11,999	2,075,421		
	Stream (Chemical)	1,687	711	63	7,433		183,521	
	Stream (Slash)	26			741			
	All Stream	5,180	4,681	1,211	20,173	2,075,421		
	All Types	111,009	4,681	1,211	95,972	25,909,904		

TABLE NO. 3B

SECOND WORKING

Name	Eradication Type	Acres	Effective Man Days	Total Ribes	Gallons Spray	Total Cost	Per Acre Basis			
							Man Days	Ribes	Gallons Spray	Cost
	Stream (Hand)	1,291	1,046	135,927			.81	105		
ECW	Stream (Chemical)	263	523		10,040		1.99		38	
Camps	All Stream	1,291	1,569	135,927			1.22	105		
	Stream (Hand)	3,390	2,345	284,466		$20,273.71	.69	84		$5.98
NIRA	Stream (Chemical)	448	616		11,362	7,276.33	1.38		25	16.24
Camps	All Stream	3,390	2,961	284,466		$27,550.04	.87	84		$8.13
ECW &	Stream (Hand)	4,681	3,391	420,393			.72	90		
NIRA	Stream (Chemical)	711	1,139		21,402		1.60		30	
Camps	All Stream	4,681	4,530	420,393			.97	90		

Annual Report 1934
B. A. Anderson

TABLE NO. 3A

FIRST WORKING

Name	Eradication Type	Acres	Effective Man Days	Total Ribes	Gallons Spray	Total Cost	Per Acre Basis			
							Man Days	Ribes	Gallons Spray	Cost
ECW Camps	Open Reproduction	5,838	11,428	1,721,138			1.96	295		
	Dense Reproduction	152	58	591			.38	4		
	Open Pole	3,766	2,677	556,480			.71	148		
	Dense Pole	435	445	78,863			1.02	181		
	Open Mature	35,299	14,567	2,672,320			.41	76		
	Dense Mature	513	3	219			.01	1		
	Cut Over	6,583	9,929	3,429,084			1.51	521		
	Burn	30	226	167,273			7.53	5,576		
	Meadow	456								
	All Upland	53,072	39,333	8,625,968			.74	163		
	Stream (Hand)	3,796	5,871	962,911			1.55	254		
	Stream (Chemical	1,344	5,285		135,142		3.93		101	
	Stream (Slash)	26	741				28.50			
	All Stream	3,796	11,897	962,911			3.13	254		
	All Types	56,868	51,230	9,588,879			.90	169		
NIRA Camps	Open Reproduction	9,750	17,175	7,504,109		$148,486.55	1.76	770		$15.23
	Dense Reproduction	737	203	59,240		1,755.04	.28	80		2.38
	Open Pole	9,118	4,747	1,304,499		41,040.21	.52	143		4.50
	Dense Pole	1,387	185	55,663		1,599.42	.13	40		1.15
	Open Mature	29,354	12,796	4,955,876		110,627.88	.44	169		3.77
	Dense Mature	585	3	298		25.94	.01	1		.04
	Cut Over	112	216	249,928		1,867.42	1.93	2,232		16.67
	Selective Cut Over	752	297	385,839		2,567.72	.39	513		3.41
	Brush	561	397	134,961		3,432.27	.71	241		6.12
	Burn	279	329	504,154		2,844.37	1.18	1,807		10.19
	Subalpine	122	118	53,948		1,020.17	.97	442		8.36
	All Upland	52,757	36,466	15,208,515		315,266.99	.69	288		5.98
	Stream (Hand)	1,384	2,004	555,736		17,325.59	1.45	402		12.52
	Stream (Chemical)	343	895		25,055	11,853.98	2.61		73	34.56
	All Stream	1,384	2,899	555,736		29,179.57	2.09	402		21.08
	All Types	54,141	39,365	15,764,251		$344,446.56	.73	291		$ 6.36
ECW and NIRA Camps	Open Reproduction	15,588	28,603	9,225,247			1.83	592		
	Dense Reproduction	889	261	59,831			.29	67		
	Open Pole	12,884	7,424	1,860,979			.58	144		
	Dense Pole	1,822	630	134,526			.35	74		
	Open Mature	64,653	27,363	7,628,196			.42	118		
	Dense Mature	1,098	6	517			.01	1		
	Cut Over	6,695	10,145	3,679,012			1.52	550		
	Selective Cut Over	752	297	385,839			.39	513		
	Brush	561	397	134,961			.71	241		
	Burn	309	555	671,427			1.80	2,173		
	Subalpine	122	118	53,948			.97	442		
	Meadow	456								
	All Upland	105,829	75,799	23,834,483			.72	225		
	Stream (Hand)	5,180	7,875	1,518,647			1.52	293		
	Stream (Chemical)	1,687	6,180		160,197		3.66		95	
	Stream (Slash)	26	741				28.50			
	All Stream	5,180	14,796	1,518,647			2.86	293		
	All Types	111,009	90,595	25,353,130			.82	228		

TABLE NO. 3C

THIRD WORKING

Name	Eradication Type	Acres	Effective Man Days	Total Ribes	Gallons Spray	Total Cost	Per Acre Basis			
							Man Days	Ribes	Gallons Spray	Cost
ECW Camps	Stream (Hand)	297	100	14,447			.34	49		
NIRA Camps	Stream (Hand)	914	633	121,934		$5,472.61	.69	133		$5.99
	Stream (Chemical)	63	114		1,922	1,319.48	1.81		31	20.94
	All Stream	914	747	121,934		$6,792.09	.82	133		$7.43
ECW & NIRA Camps	Stream (Hand)	1,211	733	136,381			.61	113		
	Stream (Chemical)	63	114		1,922		1.81		31	
	All Stream	1,211	847	136,381			.70	113		

Annual Report 1934
B. A. Anderson

TABLE NO. 4

OWNERSHIP OF LAND COVERED ON RIDES ERADICATION 1934
CLEARWATER PROJECT

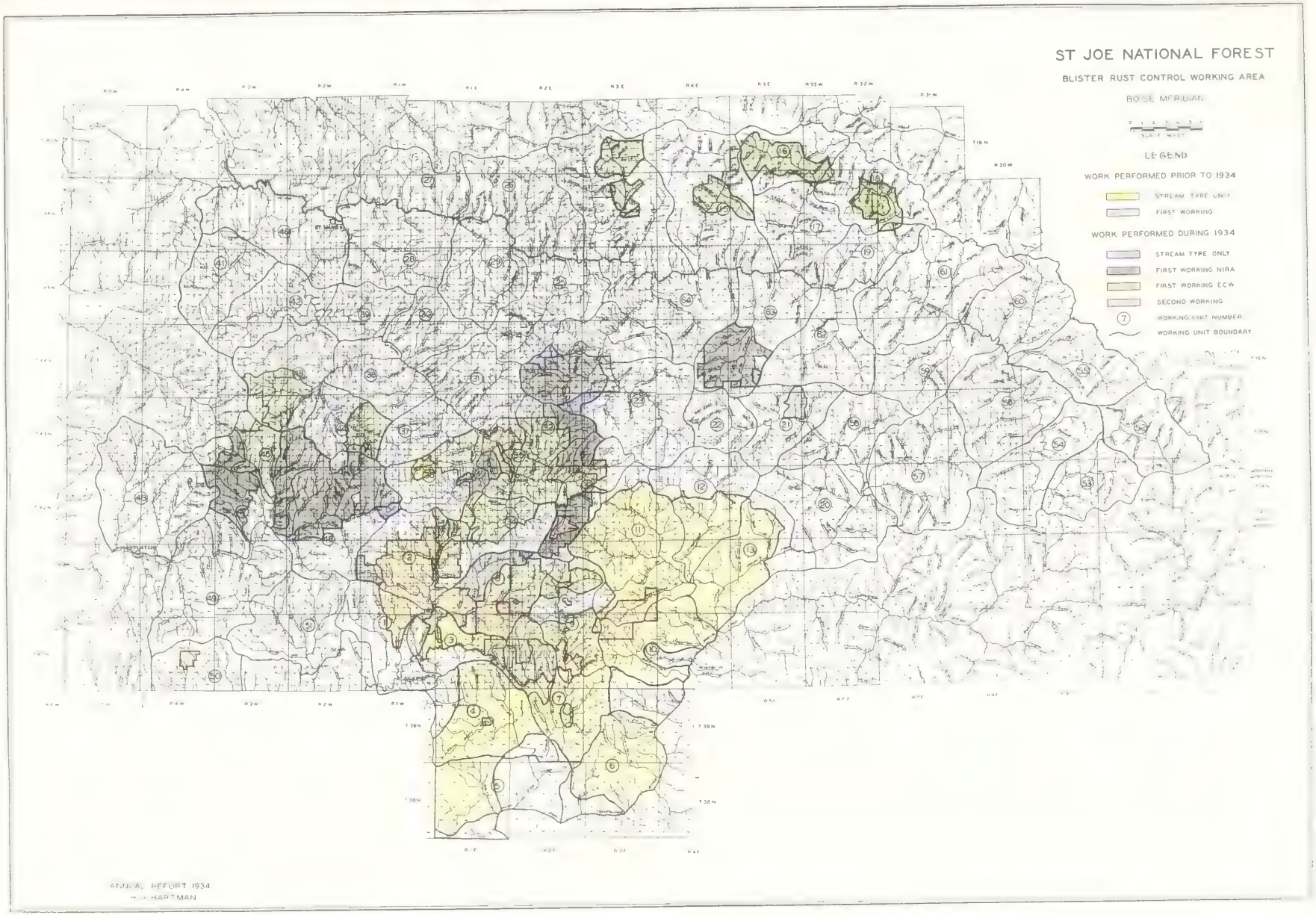
Working	Number of Acres Worked by Ownership Classes			Total Acres
	Federal	State - Idaho	Private	
First	47,859	22,568	40,582	111,009
Second	1,494	1,620	1,567	4,681
Third	985	100	126	1,211
All Workings	50,338	24,288	42,275	116,901

TABLE NO. 5

RESULTS OF CHECKING ON AREAS WORKED DURING 1934
CLEARWATER PROJECT

Name	Eradication Type	Regular Check on Worked Areas																Area Eliminated from Crew Work														Summary		
		Acres in Checked Area	Acres Checked	Ribes per Acre														Acres in Checked Area	Acres Checked	Ribes per Acre												Total Acres in Checked Area	Total Acres Checked	Percent Check
				Ribes lacustre		Ribes viscosissimum		Ribes petiolare		Ribes inerme		Ribes irriguum		All Species			Seedlings			Ribes lacustre		Ribes viscosissimum		Ribes petiolare		Ribes irriguum		All Species			Seedlings			
				Bu	L.S.	Bu.	L.S	Bu.	L.S.	Bu.	L.S.	Bu.	L.S	Bu.	L.S.					Bu.	L.S.	Bu.	L.S.	Bu.	L.S.	Bu.	L.S.	Bu	L S.						
ECW	Open Reproduction	5,340	228	3	13	4	19	1	1					8	33	2		262	10			1	15					1	15			5,602	238	4.2
	Dense Reproduction	144	6	1	3	1	1	1	2					3	6	1														-		144	6	4.2
	Open Reproduction	3,867	117	2	7	2	15	1	1	1	1			6	24	1		778	32	1	7							1	7	-		3,645	149	4.1
	Dense Pole	365	16	2	8	1	1	-	-					3	9	1		31	1							3	44	3	44	-		416	17	4.1
	Open Mature	27,977	1,169	2	10	1	6	1	1	1	1	1	1	6	19	1		8,118	325	1	7	1	4	1	1	1	1	4	13	1		36,095	1,494	4 1
	Dense Mature	495	21	1	9	1	1	-	-					2	10	1																495	21	4.2
	Cut Over	5,856	249	3	10	5	14	1	1					10	26	16		1,195	49	1	1	1	4			1	1	3	6	1		7,051	298	4.2
	Burn	28	1	-	-	18	112	-	-					18	112	53																28	1	3.6
	Meadow	389	16	1	3	-	-	-	-	1	1			2	4	-		48	3			1	10					1	10	-		437	19	4.3
	All Upland	43,461	1,529	2	10	2	9	1	1	1	1	1	1	7	22	3		10,432	420	1	6	1	4	1	1	1	1	4	12	1		53,913	2,243	4.2
	Stream	2,426	448	3	14	1	1	2	12	1	1	1	1	8	29	3																2,426	448	18.5
NIRA	Open Reproduction	9,205	395	2	6	6	22	1	1	1	1			10	30	2																9,205	395	4.3
	Dense Reproduction	738	32	1	1	3	11							4	12	1																738	32	4.3
	Open Pole	8,890	391	3	18	1	9	1	1					5	28	1																8,890	391	4.4
	Dense Pole	1,290	50	1	10	1	3							2	13	1																1,290	50	3.9
	Open Mature	26,127	1,145	2	11	1	7	1	1					4	19	1		1,502	61	2	16	1	3	1	5			4	24	1		27,629	1,206	4.4
	Dense Mature	275	12	1	7	1	2	1	1					3	10	-		593	24	1	6							1	6	1		868	36	4.1
	Cut Over	833	37	1	2	4	9	1	1					6	12	33																833	37	4.4
	Brush	548	24	3	14	1	1	1	1					5	16	2																548	24	4.4
	Burn	277	13	1	1	8	12	1	2					10	15	23																277	13	4 7
	Subalpine	110	5	2	13	1	1							3	14	-																110	5	4.5
	All Upland	48,293	2,104	2	11	2	10	1	1	1	1			6	23	2		2,095	85	2	13	1	2	1	3			4	16	1		50,388	2,189	4.3
	Stream	5,230	918	3	11	1	1	2	4	1	1			7	17	2																5,230	918	17 6
ECW and NIRA	Open Reproduction	14,545	623	2	9	5	21	1	1	1	1			9	32	2		262	10			1	15					1	15			14,807	633	4.3
	Dense Reproduction	882	38	1	1	3	9	1	1					5	11	1																882	38	4.3
	Open Pole	11,757	508	3	16	2	7	1	1	1	1			7	25	1		778	32	1	7							1	7			12,535	540	4.3
	Dense Pole	1,675	66	1	10	1	2							2	12	1		31	1							3	44	3	44			1,706	67	3.9
	Open Mature	54,104	2,314	2	10	1	6	1	1	1	1	1	1	6	19	1		9,620	386	1	8	1	4	1	1	1	1	4	14	1		62,724	2,700	4.2
	Dense Mature	770	33	1	8	1	1							2	9	1		593	24	1	6							1	6	1		1,363	57	4.2
	Cut Over	6,689	286	2	9	5	14	1	1			1	1	9	25	18		1,195	49	1	1	1	4			1	1	3	6	1		7,884	335	4.2
	Brush	548	24	3	14	1	1	1	1					5	16	2																548	24	4.4
	Burn	305	14	1	1	8	19	1	2					10	22	25																305	14	4.6
	Subalpine	110	5	2	13	1	1							3	14																	110	5	4.5
	Meadow	389	16	1	3					1	1			2	4			48	3			1	10					1	10			437	19	4.3
	All Upland	91,774	3,927	2	11	2	9	1	1	1	1	1	1	7	23	2		12,527	505	1	7	1	4	1	1	1	1	4	13	1		104,301	4,432	4.2
	Stream	7,656	1,366	3	12	1	1	2	7	1	1	1	1	8	22	3																7,656	1,366	17.8

Annual Report, 1934
H. J Faulkner


ST JOE NATIONAL FOREST
BLISTER RUST CONTROL WORKING AREA
BOISE MERIDIAN
LEGEND
WORK PERFORMED PRIOR TO 1934
STREAM TYPE ONLY
FIRST WORKING
WORK PERFORMED DURING 1934
STREAM TYPE ONLY
FIRST WORKING NIRA
FIRST WORKING ECW
SECOND WORKING
WORKING UNIT NUMBER
WORKING UNIT BOUNDARY
ANNUAL REPORT 1934
H.K. HARTMAN

RIBES ERADICATION, ST. JOE PROJECT

By
H. J. Hartman, Associate Forester
Division of Plant Disease Control
and
Neil Fullerton, Junior Forester
Forest Service

INTRODUCTION

For economical and administrative reasons the St. Joe project now includes all of the main division of the St. Joe National Forest, the Palouse Division of the St. Joe National Forest and the former Coeur d'Alene and Potlatch Timber Protective Associations. Due to the mixed land ownership throughout all areas, data in this report are presented for the project as a whole. Ribes eradication, on a small scale, was started on the St. Joe project in 1928 and was continued through 1931. This was confined chiefly to work in the stream type, as a delay measure against the invasion and further spread of blister rust. An intensive program with thirteen small camps was started in the Avery region of the main St. Joe National Forest in 1932. Both stream and upland types were freed of Ribes and the work was confined chiefly to the protection of valuable western white pine plantations.

The 1933 program called for the complete eradication of Ribes from the best young white pine stands on the project. The operation which was located in the southwestern portion of the project consisted of fourteen ECW camps and seven NIRA 50-man camps.

The 1934 operation was composed of twenty-six 30-man NIRA camps which were financed by the U. S. Forest Service, ten 30-man NIRA camps which were financed by the Division of Plant Disease Control and eleven ECW camps which were financed out of Emergency Conservation Funds.

FIELD EXPERIMENTS IN BLISTER RUST CONTROL

By

H. J. Hartman, Associate Forester
Division of Plant Disease Control
and
Neil Polletti, Junior Entomologist
Forest Service

INTRODUCTION

For economical and administrative reasons the St. Joe project now includes all of the main division of the St. Joe National Forest, the Palouse Division of the St. Joe National Forest and the former Coeur d'Alene and Potlatch Timber Protective Associations. Due to the mixed land ownership throughout all areas, data in this report are presented for the project as a whole. Rifle eradication, on a small scale, was started on the St. Joe project in 1931 and was continued through 1931. This was confined chiefly to work in the [illegible] as a delay measure against the invasion and further spread of blister rust. An intensive program with thirteen small camps was started in the Avery region of the main St. Joe National Forest in 1932. Both stream and upland types were [illegible] and the work was [illegible] of the white pines, chiefly western white pine plantations.

The 1933 program called for the complete eradication of [illegible] the best young white pine stands on the project. The operation which was located in the southwestern portion of the project consisted of [illegible] seven WPA 50-man camps.

The 1934 operation was composed of twenty-six 50-man WPA camps which were financed by the U. S. Forest Service, ten 50-man WPA camps which were financed by the Division of Plant Disease Control and eleven 50-man camps which were financed out of Emergency Conservation Funds.

LOCATION AND DESCRIPTION OF AREAS

It is found that the areas worked in 1934 can best be described by referring to the ecological types set forth in the "Western Blister Rust Control Program", compiled November 1934, which are as follows:

Type I. Newly disturbed or denuded areas, upon which the young coniferous stand has only recently started, and representing conditions favorable to the appearance and persistence of Ribes. This type represents areas upon which the Ribes population is still increasing, and will as a general rule require three workings at three-year-intervals before maintenance conditions are established.

Type II. Coniferous stands of pole or merchantable size in which the forest density is so light as to permit the continued growth and reproduction of Ribes. Upon this type it is found that broadly speaking the Ribes population has reached an equilibrium, meaning that these species have established themselves as a component part of the ecological association; are able to maintain themselves in this condition due to the general openness of the timber stand, and show relatively little tendency to either increase or decrease in numbers. For most of this type two workings will be sufficient to establish maintenance conditions.

Type III. Coniferous stands of pole or merchantable size in which the forest density is so heavy as to gradually preclude the occurrence and reproduction of Ribes. In this type it is frequently found that the Ribes population is decreasing. No new bushes are appearing and the old veteran bushes which established themselves upon such areas prior to the closing of the dense timber canopy are slowly dying out. Such areas would normally free themselves entirely of Ribes if time would permit, and if no small local openings occurred in the timber canopy. Under the conditions of rust intensification now existing in the Inland Empire, however, it is impossible to leave these bushes until they are naturally removed because they would infect and kill adjacent pines to such an extent as to cause local openings in the timber canopy and thereby favor their own reproduction. In general, Type III requires but a single working to place it on a maintenance basis.

Type IV. The narrow belt along streams over which the coniferous canopy is broken, permitting the permanent occurrence of brush and hardwood tree species, and favoring the occurrence, reproduction and natural increase of Ribes. In this type is found an ecological condition customarily favorable to Ribes persistence, growth and reproduction. On most of such areas the Ribes population has here also assumed its permanent part of the ecological association, and therefore tends to increase only to a small extent if at all. However, its part in this association is frequently quite great. Since conditions are uniformly and constantly favorable to Ribes growth in this type, a strong and aggressive eradication effort is necessary to place it on a maintenance condition. This customarily requires three workings.

Practically all of the upland areas covered on the Marble, Emerald, West Fork of Potlatch, Elk and Cameron Creek drainages, as well as that area covered in working unit 1, as shown on progress map accompanying this report, and

LOCATION AND DESCRIPTION OF AREAS

It is found that the areas worked in 1934 can best be described by referring to the ecological types set forth in the "Twelve Year Program", compiled November 1934, which are as follows:

Type I. Newly disturbed or denuded areas, upon which the young coniferous stand has only recently started. Not objectionable from the standpoint of fire. This type temporarily creates conditions favorable to the appearance and reclamation of Tsuga. Upon which the Tsuga population is still increasing, and will in a period of require three workings at three-year-intervals before maintenance conditions are established.

Type II. Coniferous stands of pole or merchantable size in which the forest density is so light as to permit the continued growth and reproduction of Tsuga. Once this type is found usually creating the Tsuga stratum has reached an equilibrium, meaning that the soil surface has developed as a component part of the ecological association; are able to maintain themselves in this condition due to the general openness of the timber stand, and show relatively little tendency to either increase or decrease in number. For most of this type two workings will be sufficient to establish maintenance conditions.

Type III. Coniferous stands of pole or merchantable size in which the forest density is so heavy as to gradually reestablish the coniferous reproduction of Tsuga. In this type it is frequently found that the Tsuga is decreasing. No new Tsuga are appearing and the old mature trees are established themselves upon such areas prior to the density of the Tsuga stratum canopy are slowly dying out. Such areas would normally free themselves of Tsuga if time would permit, and if no small local openings created by timber canopy. Under the conditions of rapid harvesting now practiced in the Inland Empire, however, it is impossible to leave these breaks until they are naturally removed because they would infect and kill adjacent Tsuga in good extent as to cause local openings in the timber canopy and thereby favor their own reproduction. In general, Type III requires but a single application of it on a maintenance basis.

Type IV. The narrow belt along streams over which the coniferous canopy is broken, permitting the permanent occurrence of Tsuga and other species, and favoring the occurrence, reproduction and natural increase of Tsuga. In this type is found an ecological condition conducive to Tsuga dominance, growth and reproduction. On most of such areas the Tsuga population has here also assumed its permanent part of the ecological association and therefore tends to increase only to a small extent if at all. However, its part in this association is frequently quite great. Since conditions are naturally and consistently favorable to Tsuga growth in this type, a strong and aggressive eradication effort is necessary to clear it on a maintenance condition. This usually requires three workings.

Practically all of the upland areas covered on the Marble, Emerald, West Fork of Potlatch, Elk and Cameron Creek drainages, as well as that area covered in working unit [illegible], as shown on the [illegible] map,



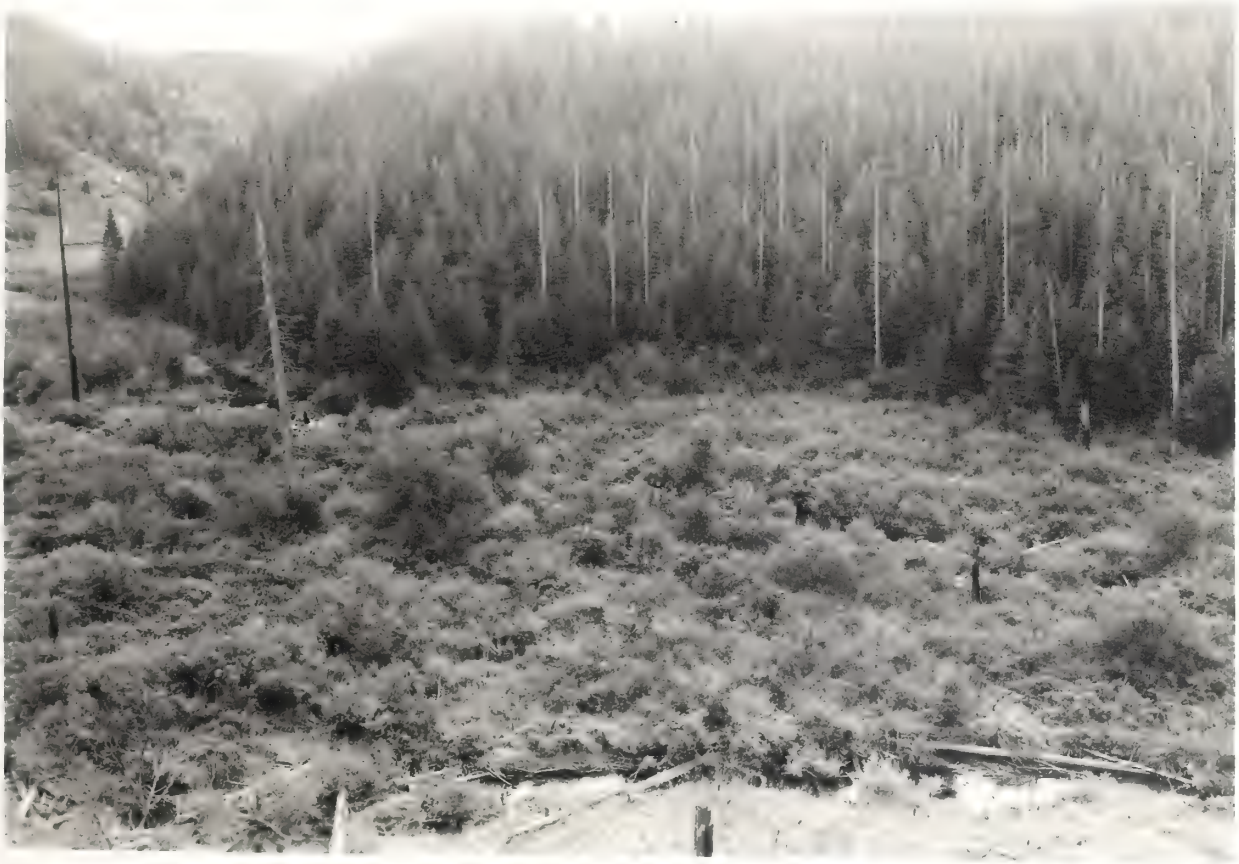
W-1090. Ecological type I as described in text.



W-943. Ecological type II as described in text.



W-1538. Ecological type III as described in text.



W-1058. Ecological type IV as described in text.

the western fourth of working unit 8, fall in type I. Heavy concentrations of Ribes lacustre and R. viscosissimum were present throughout these areas. Type IV on the Marble, Emerald and Elk Creek drainages was very difficult to work and for the most part supported very heavy concentrations of R. petiolare, R. inerme and R. lacustre. R. triste occurred along many of the streams of the Marble Creek drainage, and R. irriguum on the upland.

The major part of the Fishhook and Twin Creek areas fall in type II, although numerous small blocks of type III occur on these areas. The upland Ribes species were R. lacustre, R. viscosissimum and R. irriguum. Due to the wide swampy stream type on these areas type IV presented the most severe and perplexing Ribes eradication problems encountered during the season. R. petiolare, R. triste and R. lacustre existed in great profusion in this type.

That portion of the areas covered in working units 32, 33, 34 and 36 in the Clarkia region represent mostly type II, although several large blocks of type III are present. The chief upland species were R. lacustre and R. viscosissimum. Nearly all of type IV on these areas had previously been treated and the second working was comparatively easy. However, the new stream type areas encountered were very difficult to work. A large amount of slashing and chemical work was required.

The eastern half of the area covered in working unit 8 and all of the area worked in units 10 and 11 fall in type III with the exception of the major ridge tops which represent type II. Light to medium concentration of R. lacustre and R. viscosissimum occurred on the upland, and medium to heavy R. lacustre in the stream type.

Approximately 75 percent of the area covered in working units 45, 46 and 47 of the Palouse Division fall in type III, and the major portion of the remainder represent type II. Medium to heavy concentrations of R. lacustre and R. inerme occurred in the stream type.

ORGANIZATION AND ADMINISTRATION

A forest officer of the St. Joe National Forest and a member of the Division of Plant Disease Control were jointly in charge of the 1934 project. The responsibility and duties of the forest officer were mainly those pertaining to organization, transportation, equipment and supplies for all camps. The project supervisor of the Division of Plant Disease Control was mainly responsible for the technical supervision of the work in the field. All food supplies and pack animal transportation were supplied by the Forest Service and they were reimbursed for that amount used by the WPA camps of the Division of Plant Disease Control. All payrolls and compensation cases of WPA camps were taken care of by the organization financing the particular camp. All payrolls and compensation cases in connection with ECW field supervisory personnel were taken care of by the Forest Service. The Clarkia Ranger Station at Clarkia, Idaho, was used as the supply base and headquarters for all camps. All field operations were directed through this point. The machinery of the organization was so set up and administered as to give full cooperation to the Army personnel at all times.

the western fourth of working [illegible], in type T. Heavy concentrations of
Rhoes lacunare and R. vinc[illegible] were [illegible] throughout [illegible] type
IV on the Marble, Emerald and Elk Creek drainages was very difficult to work
and for the most part support[illegible] concentrations of R. pedicellare,
R. inerme and R. lacunare. [illegible] occurred along many of the streams of
Marble Creek drainage, and R. hystrium on the upland.

The major part of the Fishhook and Twin Creek areas fall in type [illegible]
although numerous small blocks of type III occur on these areas. The upland
[illegible] were [illegible], [illegible] and [illegible], [illegible]
wide swampy stream type on these areas type IV presented the most severe and
[illegible] problem. [illegible]
R. triste and R. lacunare existed in great profusion in this type.

That portion of the areas covered in working units 82, 83, 84 and 86
in the Clarkia region represent mostly type II, although several large blocks of
type III are present. The chief upland species were R. lacunare and R. vince-
siflorum. Nearly all of type IV on these areas had previously been [illegible]
the second working was comparatively easy. However, the new stream type areas
encountered were very difficult to work. A large amount of slashing and chemi-
cal work was required.

The eastern half of the area covered in working unit 8 and [illegible]
area worked in units 10 and 11 fall in type III with the exception [illegible]
ridge tops which represent type II. Light to medium concentrations
and R. viscosissimum occurred on the upland, and medium to heavy [illegible]
the stream type.

Approximately 75 percent of the area covered in working units 45, 46
and 47 of the Palouse Division fall in type III, and the major portion of the
remainder represent type II. Medium to heavy concentrations of R. lacunare
and R. inerme occurred in the stream type.

ORGANIZATION AND ADMINISTRATION

A forest officer of the St. Joe National Forest and a member of the
Division of Plant Disease Control were jointly in charge of the [illegible].
The responsibility and duties of the forest officer were mainly those pertain-
ing to organization, transportation, equipment and supplies for all camps. The
project supervisor of the Division of Plant Disease Control was mainly respon-
sible for the technical supervision of the work in the field. All food supplies
and pack animal transportation were supplied by the Forest Service and they
were reimbursed for that amount used by the CCC camps of the Division of Plant
Disease Control. All hayrolls and compensation cases of CCC camps were taken
care of by the organization financing the particular camp. All hayrolls and
compensation cases in connection with [illegible] were taken care of by the Forest Service. The [illegible] Bureau Station at Clarkia,
Idaho, was used as the supply base and headquarters for all [illegible]. All field
operations were directed through this point. The machinery of the organization
was so set up and administered as to give full cooperation to the Army personnel
at all times.

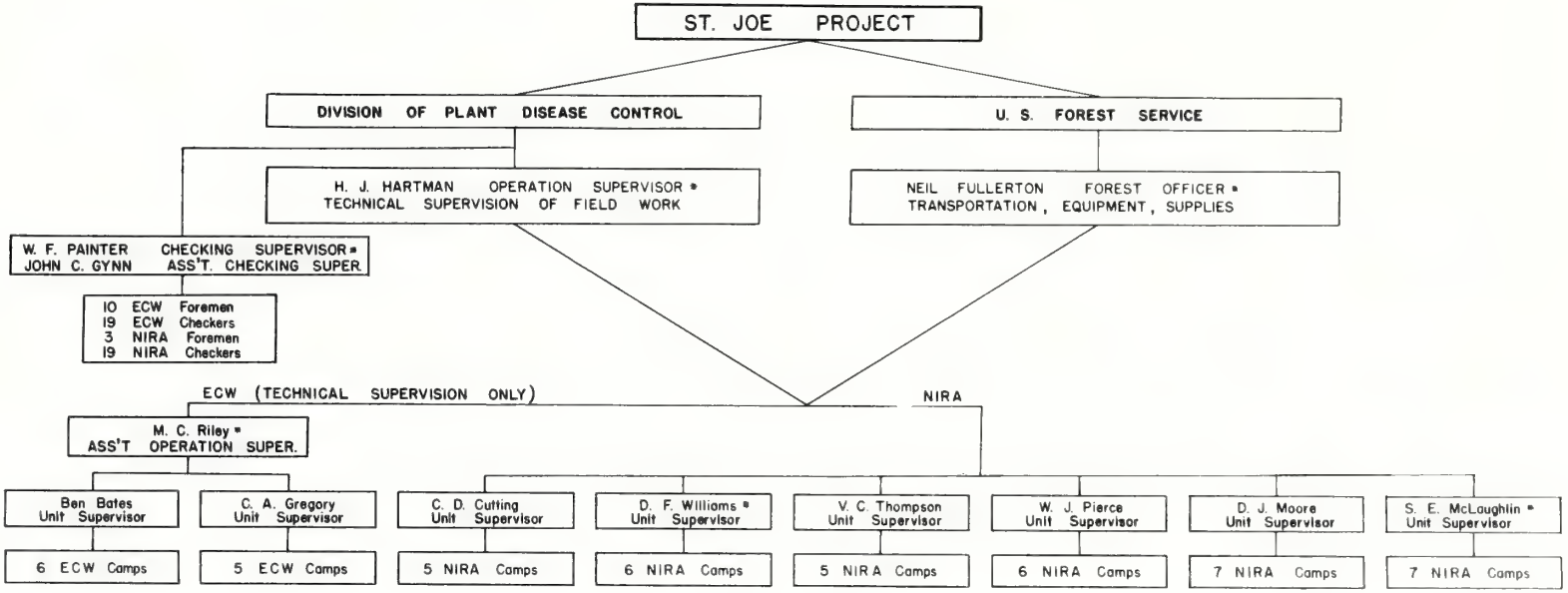
Each of the ECW camps had the usual Army personnel, the field work being under the direct supervision of a camp superintendent assisted by either six or seven foremen. The camp superintendent and foremen were all experienced woodsmen, and many of them were well acquainted with the problems of handling large crews of men engaged in blister rust control work.

A foreman was placed in charge of each 30-man NIRA camp, and was held directly responsible for the progress of his camp. Many of the camps had an assistant camp foreman who aided the camp foreman in conducting his field work and assisted him with his maps, records and reports. This allowed the camp foreman to give much closer supervision to the crews in the field.

Each of the ECW camps had the usual Army personnel, the field work
six or seven foremen. The camp superintendent and foremen were all enrolled
woodsmen, and many of them
large crews of men engaged in diverse but control work.

A foreman was placed in charge of each 50-man NYA camp, and was
directly responsible for the progress of his camp. Many of the camps had an
assistant camp foreman who aided the camp foreman in conducting the field work
foremen to give much closer supervision to the crews in the field.

ORGANIZATION CHART



SIZE OF ECW ORGANIZATION

Number of Camps - 11

7 100 percent

3 75 percent

1 10 percent

Total number of men on blister rust work - 2010

SIZE OF NIRA ORGANIZATION

Number of Camps - 36

36 30-man camps

Total number of men on blister rust work - 1180

* Employed full year

ANNUAL REPORT 1934
H. J. HARTMAN

WOW

The personnel of the ECW camps, with the exception of the supervisory and local quota men, was from the following states: two camps from New York, two camps from Idaho, and in each of the seven other camps the men were from Ohio, Indiana and Kentucky. Very few of these men had blister rust control experience although a large number of them had performed manual labor. The ECW workers this year were of a much higher caliber than those employed in 1933.

The NIRA camps were made up entirely of local men. Nearly all of them were employed through the National Reemployment Service offices of Benewah, Latah and Shoshone Counties of Idaho. About one-fourth of the men were experienced in blister rust control work. The other men, although lacking blister rust control training, were for the most part experienced in woods work. The labor turn-over was high due to the fact that many men quit their jobs rather than fight forest fires.

METHODS AND EQUIPMENT

Due to the large supervisory force required and the amount of time needed to establish camps, it was necessary to conduct three separate training schools on the St. Joe project. The first school was conducted for all unit supervisors, all ECW superintendents and one-half of the NIRA foremen. The second school trained all ECW foremen, and the third school was held for the rest of the NIRA foremen. All phases of white pine blister rust and the work connected with it were covered in the classroom as well as in the field. Special emphasis was placed on the field organization, methods, maps, records and reports in connection with the work at hand. Mr. Elers Koch spoke on the economics of western white pine lumber industry, and Mr. C. C. Strong talked on the problems of the work at hand. Mr. H. E. Swanson gave a talk on Ribes eradication methods. Illustrated lectures were used throughout. In addition there were provided exhibits, pamphlets, articles and various other materials which all men in training studied during the period of training.

Three methods of Ribes eradication were used on the project; namely, hand pulling, chemical and slashing. For hand pulling, the standard 3-man crew was used. However, in ECW camps it was often necessary to use six-and eight-man crews due to the lack of reliable crew leaders. Both ECW and NIRA foremen kept their crews closely grouped in order to give as close supervision as possible. Late in the season when the output per man and the efficiency of the work began to slacken, it was necessary for nearly all ECW foremen to work all the men assigned to them as one Ribes eradication crew with the foreman and one or two assistant leaders following closely behind the crew. This method was also used when the working conditions were extremely difficult and also when the caliber of men available was low.

For chemical work Atlacide, at the rate of 1.5 pounds per gallon of water, was used during the major part of the season. The chemical was applied to R. petiolare by 5-man crews using the regulation knapsack spray outfit. Mop-up spraying followed all early season spraying.

The wide belts of stream type which supported dense concentrations of R. inerme growing in close association with very heavy brush were worked by the slashing method. The slashing crews ranged from 3 to 35-man crews headed by a

The personnel of the TVA camps, with the exception of the supervisory and local quota men, was from the following states: [illegible] Ohio, Indiana and Kentucky. Only [illegible] had prior forestry experience although a large number of them had performed manual labor workers this year were of a much higher caliber than those employed in

The NYA camps were made up entirely of local men. Nearly all of them were employed through the National Unemployment Service offices of Tennessee, Kentucky, Alabama and Mississippi. About one-fourth of the men had previously had experience in blister rust control work.

Labor turn-over was high due to the fact that [illegible] rust control training, were for the most [illegible]

Due to the large supervisory force required [illegible] needed to establish camps, it was necessary to [illegible] schools on the job. The first school was [illegible] supervisors, all TVA superintendents and one-half of [illegible] second school trained all TVA foremen, and the third [illegible] rest of the NYA foremen. All phases of white pine [illegible] connected with it were covered in the classroom as [illegible] and lectures in connection with the work as [illegible] economics of western white pine lumbering, and [illegible] the problems of the work at hand. Mr. R. T. Swanson [illegible] which all men in training studied during the period [illegible] There were provided exhibits, pamphlets, articles, [illegible]

Three methods of blister eradication were used. Hand pulling, chemical and sloughing. Hand pulling [illegible] crew was used. However, in TVA camps it was often necessary [illegible] eight-man crews due to the lack of reliable crew leaders. [illegible] foremen kept their crews closely grouped in order to [illegible] as possible. Late in the season when the control men [illegible] the work began to slacken, it was necessary for nearly all [illegible] all the men assigned to them as the Nine conifer crew [illegible] one or two assistant leaders following closely behind the crew. [illegible] the caliber of men available was low.

For chemical work [illegible], at the rate of 1.5 pounds per [illegible] water, was used during the major part of the season. The chemical [illegible] to K. petiolare by 5-man crews using the regular Pumpback machine [illegible] no spraying followed all early season [illegible].

The wire belts of chosen type which connected [illegible] K. imerne growing in close association with very heavy [illegible] sloughing method. The [illegible] were removed from 3 to 10-year [illegible]







W-1229. Series of pictures taken on lower Merry Creek near Clarkia, Idaho. Upper picture, taken August, 1933, shows stream bottom area before slashing in which R. inerme and other species of Ribes are very abundant. Center picture is the same area after the brush had been slashed and piled for burning. Lower picture, taken [illegible] 1934, shows the same area one year following burning. Second eradication on this area [illegible] day per acre.

crew leader or foreman. All Ribes were pulled as the brush was cut and piled. The Pulaski was found to be the most desirable tool for this work. All slashings were burned in the fall and the areas planted to grass. Kentucky blue grass and timothy seed were sown at a ratio of 5 pounds of Kentucky blue grass to 3 pounds of timothy per acre. A total of 4,300 pounds of seed was used.

CHECKING

The purpose of the checking organization was to inspect and furnish immediate information as to the number and distribution of Ribes remaining on areas following Ribes eradication in order to insure efficient work.

The organization consisted of a checking supervisor, an assistant, three NIRA foremen, 19 NIRA checkers, 10 ECW checker foremen and 19 ECW checkers. The three NIRA foremen and 19 NIRA checkers handled the checking in 36 NIRA 30-man camps. The 10 ECW foremen and 19 ECW checkers constituted the checking personnel in the 10 ECW camps.

The areas were checked by running parallel sample strips 13.2 feet in width at five-chain intervals over the area. This constituted a four percent check. Data were recorded along the strip and later plotted on a field map, showing total number of bushes and amount of live stem for each five chain transect.

NIRA checkers devoted practically 100 percent of their time to checking. ECW checkers contributed 25 percent of their time to eradication work, such as training new men, supervising crews, mapping for the camp superintendent and reworking areas. The remaining 75 percent of the time was given to actually checking worked areas.

The cost per acre for checking NIRA camp areas was $. 11.
The cost per acre for checking ECW camp areas was $.19.
The composite checking cost per acre for all camps was $.14 per acre.

PREERADICATION

The 1934 preeradication survey party consisted of a chief of party, eight recorders and a cook. A total of 309,760 acres, most of which was in the headwaters of the St. Joe River, was covered. Due to the amount of area to be inspected it was necessary to use the scouting method of survey. Each man worked approximately two sections per day. The same information was recorded as in 1933 with the exception that age classes of all species and density of stocking of species other than western white pine were omitted. On the St. Joe project at present there are 68,000 acres to be inspected, and 300,360 acres which have been covered only by timber reconnaissance survey.

STATEMENT OF EXPENDITURES AND COSTS

The statement of expenditures and costs include only those funds expended from NIRA allotments to the United States Forest Service and Bureau of Entomology and Plant Quarantine, in addition to funds disbursed from regular

crew leader or foreman. All bribes were pulled as the brush was cut and piled.

The Pulaski was found to be the most suitable tool for removing vine maples and light underbrush. All other brush was cut with brush hooks.

to 3 pounds of timothy per acre. A total of 4,000 pounds of seed was used.

The purpose of the checking organization was to inspect and furnish immediate information as to the number and distribution of mines remaining in areas following Mines eradication in order to insure efficient work.

The organization consisted of a checking supervisor, an assistant, three CCC foremen, 10 work checkers, 10 mine checkers, and 2 CCC clerks. The 10 mine checkers and 10 work checkers were selected from personnel in the 10 CCC camps.

The areas were checked by running parallel sample strips 13.2 feet in width at five-chain intervals. This distance was chosen as the most practical for checking mines. Data were recorded on the mine checker's form showing total number of mines found in each 13.2-foot line strip sect.

MCCA checkers devoted practically 100 percent of their time to checking. The checkers completed an average of three and one-half miles of strip per day. Checking was done during the winter months when the ground was free from snow. Checking was done in strips.

The cost per acre for checking MCCA camp areas was $3.11.
The cost per acre for checking ECW camp areas was $4.19.
The composite checking cost per acre for all camps was $3.14 per acre.

The 1934 preeradication survey nearly completed of a chief of party, eight recorders and a cook. A total of [illegible] acres, [illegible] of which was in the headwaters of the St. Joe River, was covered. Due to the amount of area to be inspected it was necessary to [illegible]. Each man worked approximately two sections per day. The same information was recorded as in 1933 with the exception that all species and density of associing of species other than western white pine were omitted. On the St. Joe project at present there are 80,000 acres to be inspected, and 300,850 acres which have been covered only by timber reconnaissance survey.

The statement of amounts and basis including only those funds expended from MCCA allotments to the United States Forest Service and Bureau of Entomology and Plant Quarantine, in addition to funds diverted from regular

appropriations allotted to these organizations for blister rust control work.

No costs are available for ECW work, except those incurred by the United States Forest Service and Bureau of Entomology and Plant Quarantine in the course of providing technical supervision to ECW work. These expenses were paid from NIRA funds and are shown in Table No. 2 under "Cooperation with ECW."

TABLE NO. 1

EXPENDITURES BY APPROPRIATIONS

Cooperating Agency	Appropriation	Amount
Forest Service	Imonira	$354,935.40
	Lieumira	15,721.02
	Other	989.99
	Total	371,646.41
Bureau of Entomology and Plant Quarantine	Regular (D.P.I.)	2,374.43
	Nira-Idaho	121,284.08
	Total	123,658.51
Total Expenditures		$495,304.92

TABLE NO. 2

CLASSIFIED EXPENDITURES

Item	NIRA	Cooperation with ECW	Total
Salaries, permanent men	$ 9,403.65	$ 6,204.60	$ 15,608.25
Wages, temporary men	345,358.09	4,034.47	349,392.56
Subsistence supplies	55,398.37	3,200.00	58,598.37
Equipment	22,396.17		22,396.17
Other supplies	37,308.43		37,308.43
Transportation and travel	14,158.04	1,843.10	16,001.14
Total expenditures	480,022.75	15,282.17	495,304.92
Less 2/3 cost of new equipment	15,489.76		15,489.76
Less cost of unused supplies	2,394.81		2,394.81
Plus 1/3 cost of old equipment	4,400.81		4,400.81
Plus cost of supplies on hand	801.46		801.46
Net cost 1934 operation	$467,440.45	$15,282.17	$482,722.62

Additional cost information:

1. Effective man-day cost - NIRA (hand eradication) $7.51
2. Effective man-day cost - NIRA (chemical eradication) $7.91
3. Food cost per man-day - NIRA $ .55
4. Number of pounds of Atlacide used, NIRA & ECW 990,000 Cost $50,300.00
5. Number of pounds twine used, NIRA & ECW 84,000 Cost $ 7,300.00

appropriations allotted to these disciplines for fiscal century work.

No cooks are available for new work, except fairly licensed by the United States Forest Service and Bureau of Entomology and Plant Quarantine in the course of providing technical assistance to [illegible] work. These expenses were paid from WPA funds and are shown in Table [illegible] under [illegible]

[illegible]

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Forest Service	[illegible]	[illegible]
	[illegible]	[illegible]
	Other	[illegible]
	[illegible]	[illegible]
Bureau of Entomology and Plant Quarantine	[illegible]	[illegible]
	Major (1.1.1.)	[illegible]
	Mite-[illegible]	[illegible]
	[illegible]	[illegible]
Total [illegible]		[illegible]

[illegible]

Item	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

1. Effective man-day cost - [illegible] (Total expenditures)
2. Effective man-day cost - [illegible] (Overhead expenditures)
3. Food cost per man-day - [illegible]
4. Number of rounds of ammunition used, [illegible]
5. Number of rounds being used, [illegible]

SUMMARY OF RIBES ERADICATION 1934
ST. JOE PROJECT

TABLE NO. 3

SUMMARY OF ALL WORKINGS

Name	Eradication Type	Acres First Working	Acres Second Working	Acres Third Working	Total Effective Man Days	Total Ribes	Gallons Spray	Total Cost
ECW Camps	Open Reproduction	36,203			42,256	11,963,918		
	Dense Reproduction	1,696			348	34,468		
	Open Pole	4,729			2,426	535,610		
	Dense Pole	1,863			489	102,041		
	Open Mature	16,814	625		11,329	3,267,400		
	Dense Mature	675			104	12,412		
	Cut Over	180			164	5,341		
	Subalpine	200			416	90,809		
	All Upland	62,360	625		57,532	16,011,999		
	Stream (hand)	1,292	1,785	536	8,808	1,887,262		
	Stream (chemical)	361	288	14	2,271		81,764	
	Stream (slash)	242			2,798			
	All Stream	1,534	1,785	536	13,877	1,887,262		
	All Types	63,894	2,410	536	71,409	17,899,261		
NIRA Camps	Open Reproduction	19,902	415		17,318	6,650,339		$130,075.81
	Dense Reproduction	9,217			2,361	517,172		17,733.51
	Open Pole	19,329			6,356	1,854,585		47,740.03
	Dense Pole	7,849			1,950	469,416		14,646.49
	Open Mature	41,150	765		17,601	5,978,422		132,201.44
	Dense Mature	316			24	3,574		180.26
	Brush	296			268	216,401		2,012.95
	Burn	268			65	15,528		488.22
	All Upland	98,327	1,180		45,943	15,705,437		345,078.71
	Stream (hand)	3,723	513		10,303	4,136,111		77,386.02
	Stream (chemical)	944			3,398		112,315	43,728.89
	Stream (slash)	13			166			1,246.83
	All Stream	3,736	513		13,867	4,136,111		122,361.74
	All Types	102,063	1,693		59,810	19,841,548		$467,440.45
ECW and NIRA Camps	Open Reproduction	56,105	415		59,574	18,614,257		
	Dense Reproduction	10,913			2,709	551,640		
	Open Pole	24,058			8,782	2,390,195		
	Dense Pole	9,712	1,390		2,439	571,457		
	Open Mature	57,964			28,930	9,245,822		
	Dense Mature	991			128	15,986		
	Cut Over	180			164	5,341		
	Brush	296			268	216,401		
	Burn	268			65	15,528		
	Subalpine	200			416	90,809		
	All Upland	160,687	1,805		103,475	31,717,436		
	Stream (hand)	5,015	2,298	536	19,111	6,023,373		
	Stream (chemical)	1,305	288	14	5,669		194,079	
	Stream (slash)	255			2,964			
	All Stream	5,270	2,298	536	27,744	6,023,373		
	All Types	165,957	4,103	536	131,219	37,740,809		

TABLE NO. 3B

SECOND WORKING

Name	Eradication Type	Acres	Effective Man Days	Total Ribes	Gallons Spray	Total Cost	Per Acre Basis: Man Days	Ribes	Gallons Spray	Cost
ECW Camps	Open Mature	625	147	23,550			.24	38		
	All Upland	625	147	23,550			.24	38		
	Stream (hand)	1,785	4,199	861,948			2.35	483		
	Stream (chemical)	288	468		15,211		1.63		53	
	All Stream	1,785	4,667	861,948			2.61			
	All Types	2,410	4,814	885,498			2.00	367		
NIRA Camps	Open Reproduction	415	102	30,600		$ 766.12	.25	74		$ 1.85
	Open Mature	765	137	27,402		1,029.01	.18	36		1.35
	All Upland	1,180	239	58,002		1,795.13	.20	49		1.52
	Stream (hand)	513	684	214,297		5,137.54	1.33	418		10.01
	All Stream	513	684	214,297		5,137.54	1.33			10.01
	All Types	1,693	923	272,299		$ 6,932.67	.55	161		$ 4.09
ECW and NIRA Camps	Open Reproduction	415	102	30,600			.25	74		
	Open Mature	1,390	284	50,952			.20	37		
	All Upland	1,805	386	81,552			.21	45		
	Stream (hand)	2,298	4,883	1,076,245			2.12	468		
	Stream (chemical)	288	468		15,211		1.63		53	
	All Stream	2,298	5,351	1,076,245			2.33			
	All Types	4,103	5,737	1,157,797			1.40	282		

Annual Report 1934
H. J. Hartman

TABLE NO. 3A

FIRST WORKING

Name	Eradication Type	Acres	Effective Man Days	Total Ribes	Gallons Spray	Total Cost	Per Acre Basis			
							Man Days	Ribes	Gallons Spray	Cost
ECW Camps	Open Reproduction	36,203	42,256	11,963,918			1.17	330		
	Dense Reproduction	1,696	348	34,468			.21	20		
	Open Pole	4,729	2,426	535,610			.51	113		
	Dense Pole	1,863	489	102,041			.26	55		
	Open Mature	16,814	11,182	3,243,850			.67	193		
	Dense Mature	675	104	12,412			.15	18		
	Cut Over	180	164	5,341			.91	30		
	Subalpine	200	416	90,809			2.08	454		
	All Upland	62,360	57,385	15,988,449			.92	256		
	Stream (hand)	1,292	3,281	842,191			2.54	652		
	Stream (chemical)	361	1,772		65,431		4.91		181	
	Stream (slash)	242	2,798				11.56			
	All Stream	1,534	7,851	842,191			5.12			
	All Types	63,894	65,236	16,830,640			1.02	263		
NIRA Camps	Open Reproduction	19,902	17,216	6,619,739		$129,309.69	.87	333		$ 6.50
	Dense Reproduction	9,217	2,361	517,172		17,733.51	.26	56		1.92
	Open Pole	19,329	6,356	1,854,585		47,740.03	.33	96		2.47
	Dense Pole	7,849	1,950	469,416		14,646.49	.25	60		1.87
	Open Mature	41,150	17,464	5,951,020		131,172.43	.42	145		3.19
	Dense Mature	316	24	3,574		180.26	.08	11		.57
	Brush	296	268	216,401		2,012.95	.91	731		6.80
	Burn	268	65	15,528		488.22	.24	58		1.82
	All Upland	98,327	45,704	15,647,435		343,283.58	.46	159		3.49
	Stream (hand)	3,723	9,619	3,921,814		72,248.48	2.58	1,053		19.41
	Stream (chemical)	944	3,398		112,315	43,728.89	3.60		119	46.32
	Stream (slash)	13	166			1,246.83	12.77			95.91
	All Stream	3,736	13,183	3,921,814		117,224.20	3.53			31.38
	All Types	102,063	58,887	19,569,249		$460,507.78	.58	192		$ 4.51
ECW and NIRA Camps	Open Reproduction	56,105	59,472	18,583,657			1.06	331		
	Dense Reproduction	10,913	2,709	551,640			.25	51		
	Open Pole	24,058	8,782	2,390,195			.37	99		
	Dense Pole	9,712	2,439	571,457			.25	59		
	Open Mature	57,964	28,646	9,194,870			.49	159		
	Dense Mature	991	128	15,986			.13	16		
	Cut Over	180	164	5,341			.91	30		
	Brush	296	268	216,401			.91	731		
	Burn	268	65	15,528			.24	58		
	Subalpine	200	416	90,809			2.08	454		
	All Upland	160,687	103,089	31,635,884			.64	197		
	Stream (hand)	5,015	12,900	4,764,005			2.57	950		
	Stream (chemical)	1,305	5,170		177,746		3.96		136	
	Stream (slash)	255	2,964				11.62			
	All Stream	5,270	21,034	4,764,005			3.99			
	All Types	165,957	124,123	36,399,889			.75	219		

TABLE NO. 3C

THIRD WORKING

Name	Eradication Type	Acres	Effective Man Days	Total Ribes	Gallons Spray	Per Acre Basis		
						Man Days	Ribes	Gallons Spray
ECW Camps	Stream (hand)	536	1,328	183,123		2.48	342	
	Stream (chemical)	14	31		1,122	2.21		80
	All Stream	536	1,359	183,123		2.54		

Annual Report 1934
H. J. Hartman

TABLE NO. 4

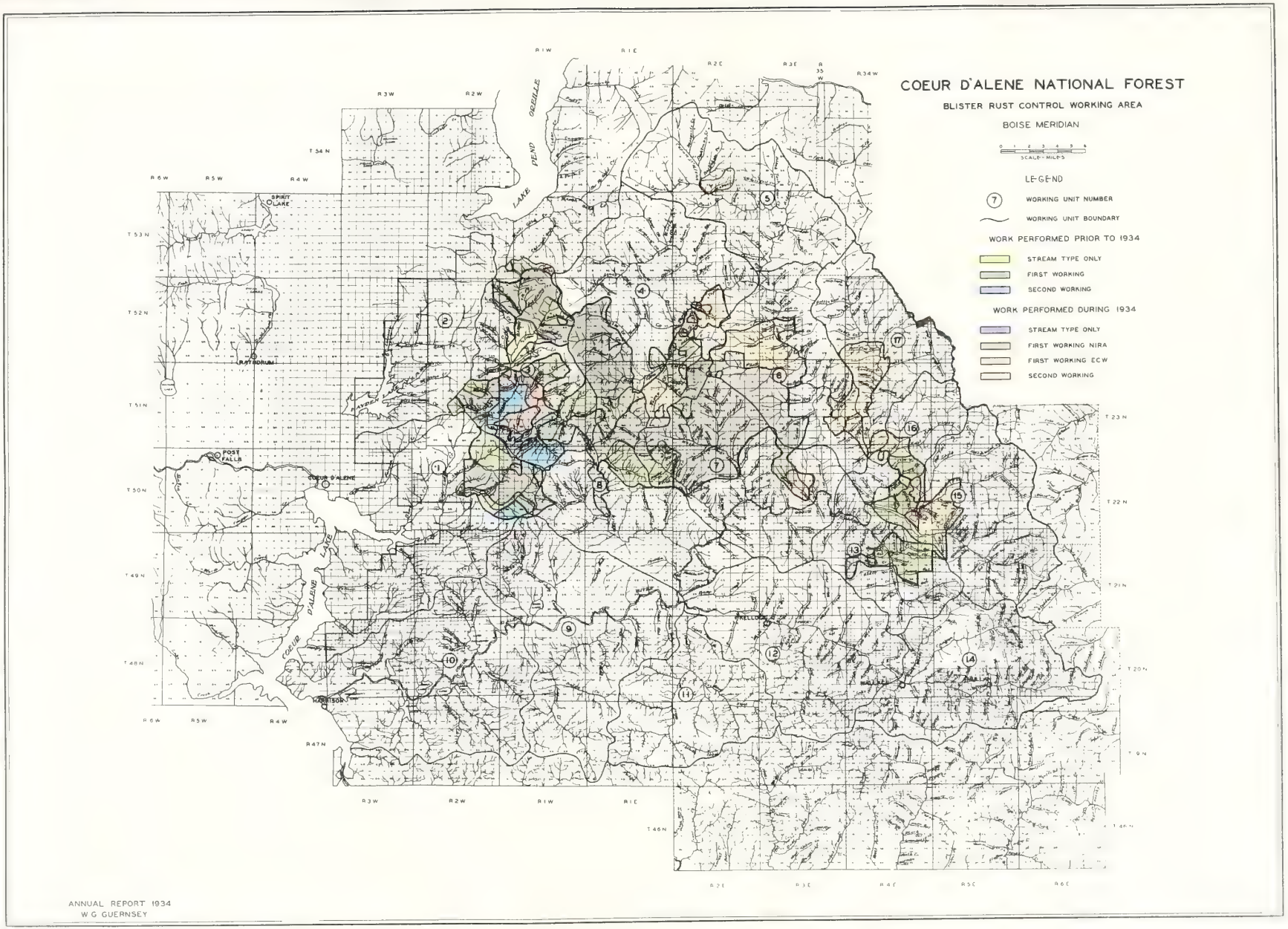
OWNERSHIP OF LAND COVERED ON RIBES ERADICATION 1934
ST. JOE PROJECT

Working	Number of Acres Worked by Ownership Classes			Total Acres
	Federal	State-Idaho	Private	
First	68,334	19,983	77,640	165,957
Second	710	460	2,933	4,103
Third	210		326	536
All Workings	69,254	20,443	80,899	170,596

TABLE NO. 5

RESULTS OF CHECKING ON AREAS WORKED DURING 1934
ST. JOE PROJECT

Name	Fradication Type	Regular Check on Worked Areas													Area Eliminated from Crew Work										Summary		
				Ribes per Acre													Ribes per Acre										
		Acres in Checked Area	Acres Checked	Ribes lacustre		Ribes viscosissimum		Ribes petiolare		Ribes inerme		All Species		Seedlings	Acres in Checked Area	Acres Checked	Ribes lacustre		Ribes viscosissimum		All Species		Seedlings	Total Acres in Checked Area	Total Acres Checked	Per cent Check
				Bu.	L.S.	Bu.	L.S.	Bu.	L.S.	Bu.	L.S.	Bu.	L.S.				Bu.	L.S.	Bu.	L.S.	Bu.	L.S.				
ECW	Open Reproduction	36,203	1,446	1	4	2	9	1	1	1	1	5	15	1										36,203	1,446	4.0
	Dense Reproduction	1,696	66	1	3	1	2					2	5	1										1,696	66	3.9
	Open Pole	4,729	189	1	5	2	9	1	1	1	1	5	16	1										4,729	189	4.0
	Dense Pole	1,809	69	1	4	1	5					2	9	1	54	2	1	1			1	1		1,863	71	3.8
	Open Mature	17,275	696	1	8	1	4					2	12	1	36	2	1	1			1	1		17,311	696	4.0
	Dense Mature	136	5			1	3					1	3	1	539	22	1	5	1	3	2	8	1	675	27	4.0
	Cut Over	180	7	1	1	2	10					3	11	1										180	7	3.9
	Subalpine	200	9	1	9	1	16					2	25	1										200	9	4.5
	All Upland	62,228	2,467	1	5	2	7	1	1	1	1	5	14	1	629	26	1	4	1	3	2	7	1	62,857	2,513	4.0
	Stream	3,161	607	3	9	1	1	1	1	1	1	6	12	1										3,161	607	19.2
NIRA	Open Reproduction	20,317	829	3	7	1	6	1	1			5	14	1										20,317	829	4.1
	Dense Reproduction	9,017	357	2	8	1	5					3	13	1	200	7	1	2			1	2		9,217	364	3.9
	Open Pole	19,229	767	2	6	1	6					3	12	1										19,229	767	4.0
	Dense Pole	7,949	328	1	4	1	5					2	9	1										7,949	328	4.1
	Open Mature	41,911	1,698	1	7	1	5					2	12	1										41,911	1,698	4.0
	Dense Mature	316	13	2	14	1	14					3	28	1										316	13	4.1
	Brush	296	12	1	1	3	8					4	9	1										296	12	4.0
	Burn	268	11	1	2							1	2	1										268	11	4.1
	All Upland	99,303	4,015	2	7	1	5	1	1			4	13	1	200	7	1	2			1	2		99,503	4,022	4.0
	Stream	3,860	894	3	9	1	1	2	2	1	1	7	13	1										3,860	894	23.2
ECW and NIRA	Open Reproduction	56,520	2,275	1	5	2	8	1	1	1	1	5	15	1										56,520	2,275	4.0
	Dense Reproduction	10,713	423	1	6	1	4					2	10	1	200	7	1	2			1	2		10,913	430	3.9
	Open Pole	23,958	956	1	5	1	7	1	1	1	1	4	14	1										23,958	956	4.0
	Dense Pole	9,758	397	1	4	1	5					2	9	1	54	2	1	1			1	1		9,812	399	4.1
	Open Mature	59,186	2,394	1	7	1	5	1	1			3	13	1	36	2	1	1			1	1		59,222	2,396	4.0
	Dense Mature	452	18	1	10	1	11					2	21	1	539	22	1	5	1	3	2	6	1	991	40	4.0
	Cut Over	180	7	1	1	2	11					3	12	1										180	7	3.9
	Brush	296	12	1	1	3	8					4	9	1										296	12	4.0
	Burn	268	11	1	2							1	2	1										268	11	4.1
	Subalpine	200	9	1	8	1	15					2	23	1										200	9	4.5
	All Upland	161,531	6,502	1	6	1	6	1	1	1	1	4	14	1	829	33	1	4	1	2	2	6	1	162,360	6,536	4.0
	Stream	7,021	1,501	3	9	1	1	1	1	1	1	6	12	1										7,021	1,501	21.4


COEUR D'ALENE NATIONAL FOREST
BLISTER RUST CONTROL WORKING AREA
BOISE MERIDIAN
SCALE - MILES
LEGEND
WORKING UNIT NUMBER
WORKING UNIT BOUNDARY
WORK PERFORMED PRIOR TO 1934
STREAM TYPE ONLY
FIRST WORKING
SECOND WORKING
WORK PERFORMED DURING 1934
STREAM TYPE ONLY
FIRST WORKING NIRA
FIRST WORKING ECW
SECOND WORKING
SPIRIT LAKE
POST FALLS
COEUR D'ALENE
HARRISON
KELLOGG
PEND OREILLE LAKE
COEUR D'ALENE LAKE
ANNUAL REPORT 1934
W G GUERNSEY

RIBES ERADICATION - COEUR D'ALENE PROJECT

By
W. G. Guernsey, Associate Forester
Division of Plant Disease Control
and
Howard Drake, Logging Engineer
Forest Service

INTRODUCTION

Experimental work of Ribes eradication on the Coeur d'Alene project was carried on in 1927, 1928 and 1929. Work was resumed in 1933 on a practical large scale basis. Prior to 1934, 61,263 acres had been covered by Ribes eradication crews.

The 1934 field season was the most important year experienced in the eradication of Ribes on the Coeur d'Alene project. With an exceptionally long field season and an increased number of men available in National Industrial Recovery Administration, Idaho Emergency Relief Administration and Civilian Conservation Corps camps, there was considerable impetus given the blister rust control program.

Phenological studies show that Ribes are the first of the forest flora to leaf out. Ribes leaves being easily distinguished in late April made it practical to start Ribes eradication early. By the first of May three NIRA and two ECW camps were established and actively engaged in Ribes eradication. In rapid succession the remaining NIRA and ECW camps' personnel were established and at work. This early season start gave added time to properly train the men and start each camp in an orderly manner.

LOCATION AND GENERAL DESCRIPTION OF AREA

The NIRA and ECW camps were distributed over practically the entire Coeur d'Alene Forest. All the camps were so located with reference to their work areas that no intervening unworked area would be left at the end of the season. The Civilian Conservation Corps camps were located on roads to facilitate transportation and the small (30-man) NIRA camps were placed in the inaccessible points, generally being supplied by pack string.

Working conditions were comparatively easy in the Cougar, Steamboat, Flat and Yellow Dog drainages. These drainages are well timbered and few Ribes were found except on the ridges or along the streams. However, on the more open sites and in the brushy areas, as in Tepee, Lower Big Creek and Lost Creek drainages, considerable difficulty was experienced. Heavy Ribes concentrations were encountered on the open slopes and in the dense brush patches.

The Coeur d'Alene Forest has been type-mapped and the non-white pine areas eliminated from the control area. The control area is the portion of the forest that has or will have sufficient white pine to be of commercial importance.

In order that crew work would be confined to those areas having Ribes, a careful check was made on all areas with any indication of being free of Ribes. The methods used in determining if these areas were Ribes free is explained in detail under preeradication methods.

Division of Plant Disease Control

and

Howard Drake, Logging Engineer

Yakima District

INTRODUCTION

Experimental work of Ribes eradication on the Coeur d'Alene project was carried on in 1927, 1928 and 1929. Work was resumed in 1930 on a practical large scale basis. Prior to 1924, 81,363 acres had been covered by Ribes eradication crews.

The 1934 field season was the most important year experienced in the eradication of Ribes on the Coeur d'Alene project. With an exceptionally long field season and an increased number of men available in National Industrial Recovery Administration, Idaho Emergency Relief Administration and Civilian Conservation Corps camps, there was considerable impetus given the blister rust control program.

Phenological studies show that Ribes are the first of the forest flora to leaf out. Ribes leaves being easily distinguished in late April made it practical to start Ribes eradication early. By the first of May three CCC and two EOW camps were established and actively engaged in Ribes eradication. In rapid succession the remaining CCC and EOW camps' personnel were established and at work. This early season start gave added time to properly train the men and start each camp in an orderly manner.

The CCC and EOW camps were distributed over practically [illegible] Coeur d'Alene Forest. All the camps were so located with reference [illegible] The Civilian Conservation Corps camps were located on roads to facilitate transportation and the small (30-man) CCC camps were placed in the inaccessible points, generally being supplied by pack string.

Working conditions were comparatively easy in the Cougar, Steamboat, Flat and Yellow Dog drainages. These drainages are well timbered and few ridges are [illegible] In the Trout creek, [illegible] Creek drainages, Ribes were found in abundance, considerable difficulty was experienced. Heavy Ribes concentrations were encountered on the open slopes and in the dense brush patches.

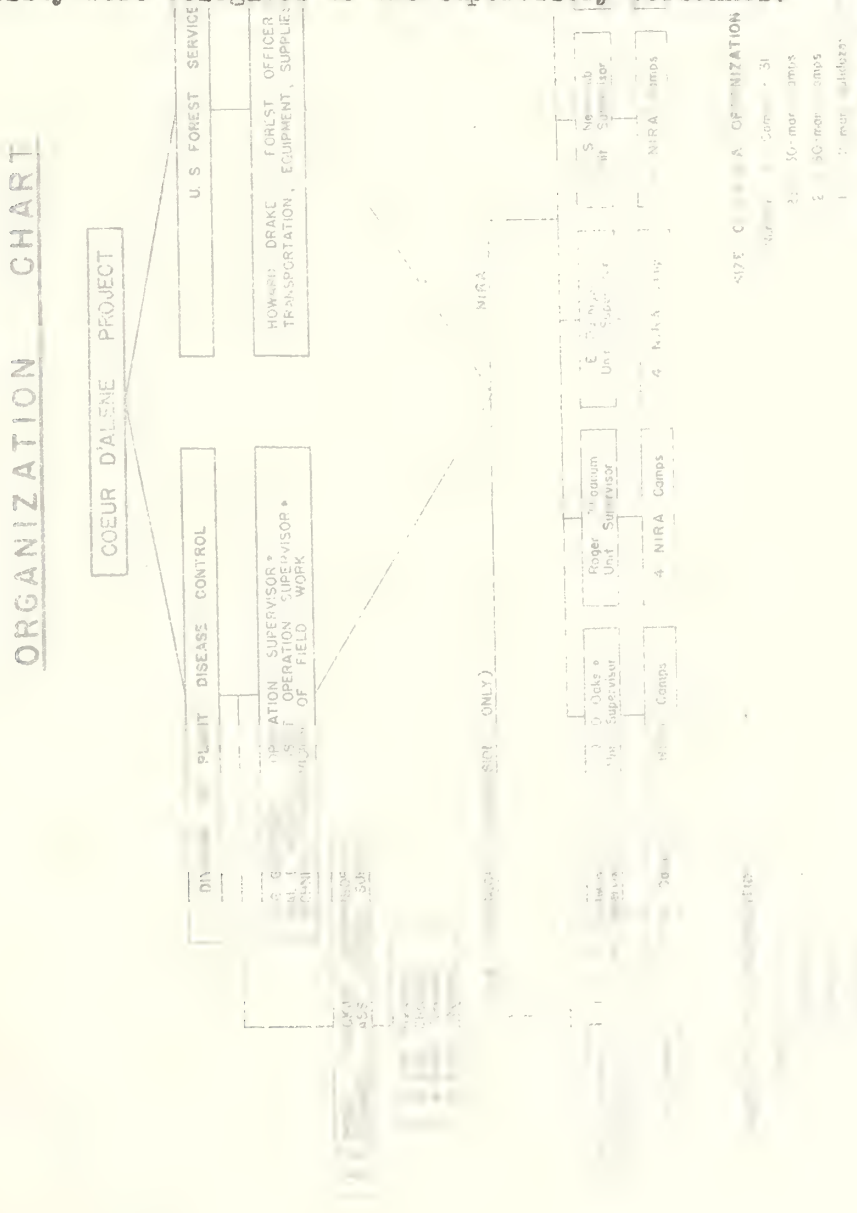
The Coeur d'Alene Forest has been type-mapped and the non-white pine areas eliminated from the control area. The control area is the portion of the forest that has or will have sufficient white pine to be of commercial importance.

In order that crew work would be confined to those areas having Ribes, a careful check was made on all areas with any indication of being free of Ribes. The methods used in determining if these areas were Ribes free is explained in detail under prescription methods.

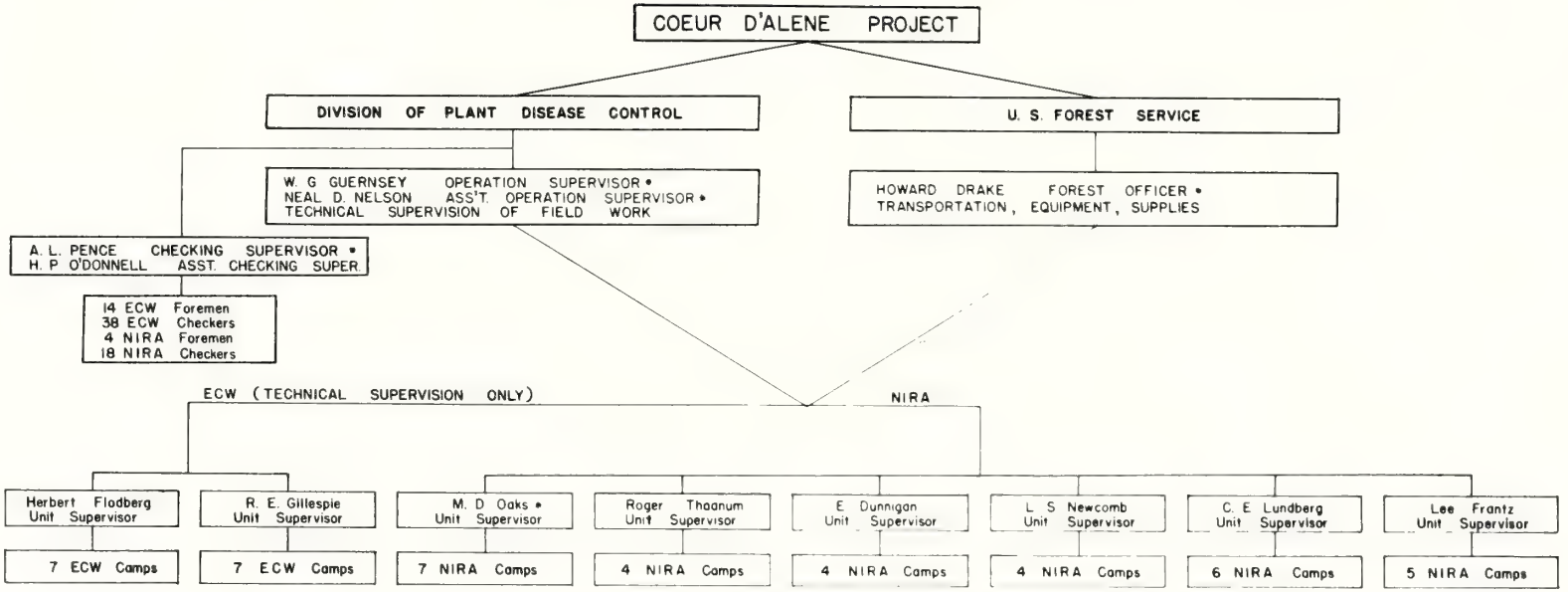
ORGANIZATION AND ADMINISTRATION

The field headquarters and supply warehouse was located at the Winton Lumber Company warehouse near Honeysuckle Ranger Station. This made a central point easily reached by road and telephone to receive and dispatch supplies and equipment. A cook house was set up to furnish subsistence to the clerk, warehouse crew and visiting inspectors. The personnel of several other projects were subsisted at this same place. This gave a sufficient number of persons to insure a low meal cost.

The organization chart illustrates the manner in which authority and responsibility were delegated to the supervisory personnel.



ORGANIZATION CHART



SIZE OF ECW ORGANIZATION

Number of Camps - 14

3 100 percent
1 95 percent
2 90 percent
6 80 percent
1 70 percent
1 50 percent

Total number of men on blister rust work - 1051

SIZE OF NIRA ORGANIZATION

Number of Camps - 31

28 30-man camps
2 60-man camps
1 12-man bulldozer camp

Total number of men on blister rust work - 981

• Employed full year

The technical field work in each CCC camp was under the direction of a camp superintendent. In one hundred percent blister rust camps he was assisted by seven technical foremen. In camps assigned partly to blister rust control a number of road and telephone foremen were assigned to assist the camp superintendent in supervising road and telephone line construction; the number varying according to the percentage of blister rust work involved. Each superintendent was assisted by an enrolled clerk to handle office details and records. In CCC camps all meals, lodging arrangements and camp details were supervised by an Army camp commander.

Each NIRA camp was under the supervision of a camp boss experienced in Ribes eradication work. He was directly in charge of mapping, the keeping of records and the general field work of 30 men. These men were assisted to some extent by checkers who mapped areas free of Ribes and made up maps showing the camp areas. The meals were prepared by a first cook, a second cook and flunkey under the general supervision of the camp boss. The camp and eradication equipment and transportation were furnished by the Forest Service.

The personnel in the ECW camps were principally from rural communities in Kentucky, Ohio and the Middle West. There were two companies from the cities of New Jersey. During the first part of the season there were eighty or more experienced men in each camp. These men were strong, healthy looking individuals capable of doing a day's work. They had been in ECW work for more than a year on fire break, road and telephone construction, and some had had experience on Ribes eradication in the Clearwater Forest the previous season. These men enrolled in the early stages of ECW work were replaced in early July. The replacements were mainly from rural communities and were accustomed to hard work with some experience in woods work. These men were more willing and interested in the field work than those in ECW work in 1933.

METHODS AND EQUIPMENT

A training school for the supervising personnel, such as unit supervisors, ECW superintendents and foremen, and NIRA camp bosses was held during April and May. These men were hired one week before their services were required in the camps. They were given lectures on blister rust and its relation to Ribes, the values of white pine at stake, camp organization, field procedure, general regulations and office methods in relation to Ribes eradication. Each phase of the work was followed by intensive training in the field in small groups and a detailed explanation of the office procedure in regard to forms and regulations was made at the field office. The training of foremen and camp bosses was continued after their assignment to camps. It was possible to carry on such a plan with a scheduled installation of camps giving sufficient time for the unit supervisors to oversee mapping work and the making of working plans. In the school, instructions on the general plans were given to the supervisory force. Later special instructions were given to small groups of the supervisory force concerned on ECW methods for large camps and NIRA methods and plans for small camps.

The general methods of crew work employed by the personnel of both ECW and NIRA camps were practically the same. The men worked in crews of three with a crew leader working in the center to enable careful observation of the

The technical field work in each CCC camp was under the direction of a camp superintendent. In one hundred percent blister rust camps he was assisted by seven technical foremen. In camps assigned partly to blister rust control a number of road and telephone foremen were assigned to assist the camp superintendent in supervising road and telephone line construction; the number varying according to the percentage of blister rust work involved. Each superintendent was assisted by an enrolled clerk to handle office details and records. In CCC camps all medical, dental, veterinary, and chaplain services were supplied by the Army camp commander.

Each WPA camp was under the supervision of a camp boss experienced in Ribes eradication work. He was directly in charge of mapping, the keeping of records and the general field work of 30 men. These men were assisted to some extent by checkers who ranged across tree of Ribes and helped locate the camp areas. The meals were prepared by a first cook, a second cook and finney under the general supervision of the camp boss. The camp and sanitary equipment and transportation were furnished by the Forest Service.

The personnel in the CCC camps were principally from rural communities in Kentucky, Ohio and the Middle West. There were two companies from camps of New Jersey. During the first part of the season there were eighty or more experienced men in each camp. There were many needing training before they capable of doing a day's work. They had been in CCC work for more than a year on fire break, road and telephone construction, and some had had experience on Ribes eradication in the Clearwater Forest the previous season. These men enrolled in the early stages of CCC work were replaced in early July. The replacements were mainly from rural communities and were unskilled so that all some experience in woods work. These men were more willing and interested in the field work than those in CCC work in 1936.

METHODS AND EQUIPMENT

A training school for the supervising personnel, such as unit supervisors, CCC superintendents and foremen, and WPA camp bosses was held during April and May. These men were hired one month during which training was in the camps. They were given lectures on blister rust and its relation to Ribes, the values of white pine at stake, camp organization, field mapping, regulations and office methods in relation to Ribes eradication. Each phase of the work was followed by intensive training in the field in small groups and a detailed explanation of the office procedure in regard to forms and regulations was made at the field office. The training of foremen and camp bosses was continued after their assignment to camps. It was possible to carry on such a plan with a scheduled installation of camps giving sufficient time for the unit supervisors to oversee mapping work and the making of working plans. In the school, instruction on the general plans were given to the supervisory force. Later special instructions were given to small groups of the supervisory force concerned on CCC methods for large camps and WPA methods and plans for small camps.

The general methods of crew work employed by the personnel of both CCC and WPA camps were practically the same. The men worked in crews of three with a crew leader working in the center to enable careful observation of the

others' work. These crews carried trench picks to assist in removing large bushes, and bushes that might be growing in or under obstructions. Practically all the Ribes were removed by pulling by hand, shaking the soil from the roots and hanging them up on branches to dry. The general system of working and crew formation details has been explained at some length in previous reports.

A bulldozer, or machine method of Ribes eradication, was used on those areas along streams having a particularly heavy growth of brush and Ribes. This method of Ribes removal followed by burning of the debris has proven very successful. In addition to machine operators it is necessary to have five or six men draining swamps, cutting large windfalls and performing other preparatory work before the clearing is made with the bulldozer. This part of the field work is explained more in detail by Mr. Breakey in his report of bulldozer operations.

CHECKING

A checking organization, acting independently of the Ribes eradication unit, checked the efficiency of the work. However, the checkers being experienced in Ribes eradication work assisted in the training of new men on eradication work at the start of the season. The checkers cooperated to the fullest extent possible to facilitate the progress of the eradication work and to insure efficient work.

All areas which were worked by crews were checked by running parallel strips across the area at 5-chain intervals. The width of strip was 13.2 feet. This constituted a four percent check. A higher percent check was made in stream type areas. The Ribes which were found were located on a map. With this method of recording missed Ribes, any areas on which more than 25 feet of Ribes live stem was left were clearly defined in order to show what areas required reworking.

As shown in Table No. 5, a considerable amount of area was eliminated from regular crew work on the basis of an advance check. This advance check was made on all areas which were relatively free from Ribes. Checkers from the ECW camps, when they had time available, performed advance checking on areas which will be included in the 1935 program. This work served the purpose of an intensive preeradication survey.

The average cost per acre for checking in NIRA camps was $.16, in ECW camps $.22. The average per acre checking cost for NIRA and ECW areas combined was $.18.

PREERADICATION

The Coeur d'Alene preeradication party consisted of the assistant project leader, five survey men and a cook. These men were selected for their experience on Ribes eradication, mapping, compass work and their knowledge of timber and age class conditions.

The party covered the lower portion of the little North Fork of the Coeur d'Alene in T. 50N, R. 1W. and R. 1E, the Smith Creek area in T. 51N. T. 50N.

Coeur d'Alene in T. 50N., R. 1W.and R. 1E., the Smith Creek area in T. 51N. T. 52N.

R. 2E, the Fourth of July Canyon and Beauty Creek areas T. 49N, R. 2 and 3 W, and the Hayden Creek areas in T. 51N, and T. 52N, R. 2 and 3W. These areas were covered during September and early October. Some difficulty was experienced during October in determining the number of Ribes. Frost and rain make Ribes leaves fall or change color to such an extent that it is hazardous to estimate the amount of work necessary for their eradication.

In the timbered areas strips were run every twenty chains with data taken on each strip 13.2 feet in width. If the stand consisted of fifteen percent or more of white pine the strips were made every ten chains. This gave assurance of obtaining representative data on all lands having valuable white pine. The following data were placed on standard forest service map sheets Number 878, and were recorded on every five chain transect along the strip: Number of Ribes, number of feet of live stem, eradication type, timber species, number of white pine per acre in immature stands, the approximate number of board feet per acre in mature stands, type lines, stream location and ridge tops. Each evening this information was plotted and recorded on a map scale four inches to the mile. Type lines, streams and ridge tops were extended at that time so that the work of all surveyors was coordinated and properly located in relation to section lines and corners. The maps made from this survey were considered correct as to location. This representative information is of value in selecting areas to be worked and in determining the amount of work necessary. It is also of great help to a camp supervisor in making up his working plan.

Any further preeradication work will be limited to a few scattered patches in the vicinity of Wallace, Idaho. There are several drainages having some white pine that may warrant protection work some time in the future.

STATEMENT OF EXPENDITURES AND COSTS

The statements of expenditures and costs include those funds expended from NIRA allotments to the United States Forest Service and the Bureau of Entomology and Plant Quarantine, in addition to funds disbursed from regular appropriations allotted to these organizations for blister rust control work. They also include funds contributed by cooperating agencies.

No costs are available for ECW work, except those incurred by the United States Forest Service and the Bureau of Entomology and Plant Quarantine in the course of providing technical supervision to ECW work. These expenses were paid from NIRA funds and are shown in Table No. 2 under "Cooperation with ECW".

during October in determining the number of Ribes. Frost and rain make Ribes leaves fall or change color to such an extent that it is hazardous to estimate the amount of work necessary for their eradication.

In the timbered areas strips were run every twenty chains with data were recorded on every five chain transect along the strip: Number of Ribes, number of feet of live stem, eradication type, timber species, number of white pine per acre in immature stands, the approximate number of board feet per acre in mature stands, type lines, stream description and type. Each information was plotted and recorded on a map scale four inches to the mile, Type lines, streams and ridge tops were extended at that time so that the work of all surveyors was coordinated and properly located in relation to section lines and corners. The maps made from this survey were considered correct as to location. This information is of value in determining the amount of be worked and in determining the amount of work necessary. It is also of great help to a camp supervisor in making up his working plan.

Any further prescription work will be limited to a few scattered patches in the vicinity of Wallace, Idaho. There are several drainages having white pine that may warrant protection work some time in the future.

STATEMENT OF EXPENDITURES AND COSTS

The statements of appropriations and costs include those funds expended from allocations to the Coeur d'Alene Forest during Planning and Plan Supervision. In addition to these allotments, [illegible] appropriations allotted to the Forest Service for blister rust control work. They also include funds contributed by cooperating agencies.

No costs are available for NEW work, except those incurred by the course of providing technical supervision to NEW work. These expenses were paid from WPA funds and are shown in Table No. 2 under "Cooperation with CCC".

TABLE NO. 1

EXPENDITURES BY APPROPRIATIONS

Cooperating Agency	Appropriation	Amount
Forest Service	Impnira	$320,115.26
	Lieunira	108,685.95
	Total	428,801.21
Bureau of Entomology and Plant Quarantine	Regular (B.P.I.)	2,548.13
	Nira-Idaho	12,957.93
	Total	15,506.06
Other Cooperative Funds	Iera	12,000.00
Total Expenditures		$456,307.27

TABLE NO. 2

CLASSIFIED EXPENDITURES

Item	NIRA	Cooperation with ECW	Total
Salaries, permanent men	$ 12,729.63	$ 5,172.89	$ 17,902.52
Wages, temporary men	322,671.05	3,244.29	325,915.34
Subsistence supplies	41,223.26		41,223.26
Equipment	46,627.80	4,292.25	50,920.05
Other supplies	305.92		305.92
Transportation and travel	19,933.98	106.20	20,040.18
Total expenditures	443,491.64	12,815.63	456,307.27
Less 2/3 cost of new equipment	31,535.24		31,535.24
Less cost of unused supplies	500.00		500.00
Plus bulldozer depreciation	1,357.00		1,357.00
Net cost 1934 operation	$412,833.40	$ 12,815.63	$425,649.03

Additional cost information:

1. Effective man-day cost - NIRA (hand eradication) $ 7.389
2. Cost of bulldozer work 8,347.46
3. Food cost per man-day - NIRA .4209
4. Number of pounds twine used, NIRA & ECW, 28,615 Cost $2,584.50

3. Cost of bulldozer work 8,897.46

3. Wood coat per man-day - MIRA ..... .4900

4. Number of pounds twice used, MIRA & ECM, 23,015 Cost $6,351.50

SUMMARY OF RIBES ERADICATION 1934
COEUR D'ALENE PROJECT

TABLE NO. 3

SUMMARY OF ALL WORKINGS

Name	Eradication Type	Acres First Working	Acres Second Working	Total Effective Man Days	Total Ribes	Total Cost
ECW Camps	Open Reproduction	11,411	1,408	30,644	3,015,382	
	Dense Reproduction	1,961	225	2,768	242,341	
	Open Pole	3,464	329	5,310	618,658	
	Dense Pole	1,228		1,402	88,716	
	Open Mature	18,002	541	22,597	1,778,420	
	Dense Mature	2,915	296	228	14,734	
	Cut Over	211	615	1,099	38,637	
	Brush	1,863	434	4,230	376,870	
	Burn	225		86	5,372	
	Subalpine	102		224	63,780	
	All Upland	41,382	3,848	68,588	6,242,910	
	Stream (hand)	2,642	559	15,900	3,092,900	
	All Types	44,024	4,407	84,488	9,335,810	
NIRA Camps	Open Reproduction	6,324	950	11,962	2,464,220	$ 88,394.13
	Dense Reproduction	1,052	55	720	100,452	5,320.50
	Open Pole	9,018	274	3,560	507,897	26,306.90
	Dense Pole	821	191	449	51,784	3,317.91
	Open Mature	54,714	1,451	27,446	6,209,217	202,814.36
	Dense Mature	1,243	44	110	13,857	812.85
	Cut Over	2,976	672	4,704	1,545,856	34,760.57
	Brush	693		887	196,269	6,554.56
	Burn	279		76	27,527	561.61
	Subalpine	359		54	12,871	399.04
	All Upland	77,479	3,637	49,908	11,129,950	369,242.43
	Stream (hand)	1,732	190	4,768	1,356,819	35,233.51
	Stream (machine)	150		779		8,347.46
	All Stream	1,882	190	5,547	1,356,819	43,580.97
	All Types	79,361	3,827	55,515	12,486,769	$412,823.40
ECW and NIRA Camps	Open Reproduction	17,735	2,358	42,606	5,479,602	
	Dense Reproduction	3,013	280	3,488	342,793	
	Open Pole	12,482	603	8,870	1,126,555	
	Dense Pole	2,049	191	1,851	140,500	
	Open Mature	72,716	1,992	50,043	7,987,637	
	Dense Mature	4,158	340	338	28,591	
	Cut Over	3,187	1,287	5,803	1,584,493	
	Brush	2,556	434	5,117	573,139	
	Burn	504		162	32,899	
	Subalpine	461		278	76,651	
	All Upland	118,861	7,485	118,556	17,372,860	
	Stream (hand)	4,374	749	20,668	4,449,719	
	Stream (machine)	150		779		
	All Stream	4,524	749	21,447	4,449,719	
	All Types	123,385	8,234	140,003	21,822,579	

Annual Report 1934
W. G. Guernsey

TABLE NO. 3A

FIRST WORKING

Name	Eradication Type	Acres	Effective Man Days	Total Ribes	Total Cost	Per Acre Basis		
						Man Days	Ribes	Cost
ECW Camps	Open Reproduction	11,411	26,324	2,711,678		2.30	238	
	Dense Reproduction	1,961	2,548	212,342		1.30	108	
	Open Pole	3,464	5,063	600,346		1.46	173	
	Dense Pole	1,228	1,402	88,716		1.14	72	
	Open Mature	18,002	21,985	1,753,495		1.22	97	
	Dense Mature	2,915	185	13,886		.06	5	
	Cut Over	211	259	16,470		1.23	78	
	Brush	1,863	3,646	292,857		1.96	157	
	Burn	225	86	5,372		.38	24	
	Subalpine	102	224	63,780		2.20	625	
	All Upland	41,382	61,722	5,758,942		1.49	139	
	Stream (hand)	2,642	13,697	2,885,026		5.18	1,092	
	All Types	44,024	75,419	8,643,968		1.71	196	
NIRA Camps	Open Reproduction	6,324	11,150	2,352,974	$ 82,393.79	1.76	372	$13.03
	Dense Reproduction	1,052	698	91,944	5,157.93	.66	87	4.90
	Open Pole	9,018	3,480	489,212	25,715.73	.39	54	2.85
	Dense Pole	821	413	47,886	3,051.89	.50	58	3.72
	Open Mature	54,714	27,272	6,195,600	201,528.57	.50	113	3.68
	Dense Mature	1,243	81	9,848	598.55	.07	8	.48
	Cut Over	2,976	4,165	1,474,935	30,777.59	1.40	496	10.34
	Brush	693	887	196,269	6,554.56	1.28	283	9.46
	Burn	279	76	27,527	561.61	.27	99	2.01
	Subalpine	359	54	12,871	399.04	.15	36	1.11
	All Upland	77,479	48,276	10,899,066	356,739.26	.62	141	4.60
	Stream (hand)	1,732	4,682	1,351,661	34,598.00	2.70	780	19.98
	Stream (machine)	150	779		8,347.46	5.19	*	55.65
	All Stream	1,882	5,461	1,351,661	42,945.46	2.90	780	22.82
	All Types	79,361	53,737	12,250,727	$399,684.72	.68	155	$ 5.04
ECW and NIRA Camps	Open Reproduction	17,735	37,474	5,064,652		2.11	286	
	Dense Reproduction	3,013	3,246	304,286		1.08	101	
	Open Pole	12,482	8,543	1,089,558		.68	87	
	Dense Pole	2,049	1,815	136,602		.89	67	
	Open Mature	72,716	49,257	7,949,095		.68	109	
	Dense Mature	4,158	266	23,734		.06	6	
	Cut Over	3,187	4,424	1,491,405		1.39	468	
	Brush	2,556	4,533	489,126		1.77	191	
	Burn	504	162	32,899		.32	65	
	Subalpine	461	278	76,651		.60	166	
	All Upland	118,861	109,998	16,658,008		.93	140	
	Stream (hand)	4,374	18,379	4,236,687		4.20	969	
	Stream (machine)	150	779			5.19	*	
	All Stream	4,524	19,158	4,236,687		4.23	969	
	All Types	123,385	129,156	20,894,695		1.05	170	

TABLE NO. 3B

SECOND WORKING

Name	Eradication Type	Acres	Effective Man Days	Total Ribes	Total Cost	Per Acre Basis		
						Man Days	Ribes	Cost
ECW Camps	Open Reproduction	1,408	4,320	303,704		3.07	216	
	Dense Reproduction	225	220	29,999		.98	133	
	Open Pole	329	247	18,312		.75	56	
	Open Mature	541	612	24,925		1.13	46	
	Dense Mature	296	43	848		.15	3	
	Cut Over	615	840	22,167		1.37	36	
	Brush	434	584	84,013		1.35	194	
	All Upland	3,848	6,866	483,968		1.78	126	
	Stream (hand)	559	2,203	207,874		3.94	372	
	All Types	4,407	9,069	691,842		2.06	157	
NIRA Camps	Open Reproduction	950	812	111,246	$ 6,000.34	.85	117	$6.32
	Dense Reproduction	55	22	8,508	162.57	.40	155	2.96
	Open Pole	274	80	18,685	591.17	.29	68	2.16
	Dense Pole	191	36	3,898	266.02	.19	20	1.39
	Open Mature	1,451	174	13,617	1,285.79	.12	9	.89
	Dense Mature	44	29	4,009	214.30	.66	91	4.87
	Cut Over	672	539	70,921	3,982.98	.80	106	5.93
	All Upland	3,637	1,692	230,884	12,503.17	.47	63	3.44
	Stream (hand)	190	86	5,158	635.51	.45	27	3.34
	All Types	3,827	1,778	236,042	$13,138.68	.46	62	$3.43
ECW and NIRA Camps	Open Reproduction	2,358	5,132	414,950		2.18	176	
	Dense Reproduction	280	242	38,507		.86	138	
	Open Pole	603	327	36,997		.54	61	
	Dense Pole	191	36	3,898		.19	20	
	Open Mature	1,992	786	36,542		.39	19	
	Dense Mature	340	72	4,867		.21	14	
	Cut Over	1,287	1,379	93,088		1.07	72	
	Brush	434	584	84,013		1.35	194	
	All Upland	7,485	8,568	714,852		1.14	96	
	Stream(hand)	749	2,289	213,032		3.06	284	
	All Types	8,234	10,847	927,884		1.32	113	

Annual Report 1934
W. G. Guernsey

*6.93 machine hours per acre.

TABLE NO. 4

OWNERSHIP OF LAND COVERED ON AIRES BRADICATION IN 1964
COEUR D'ALENE PROJECT

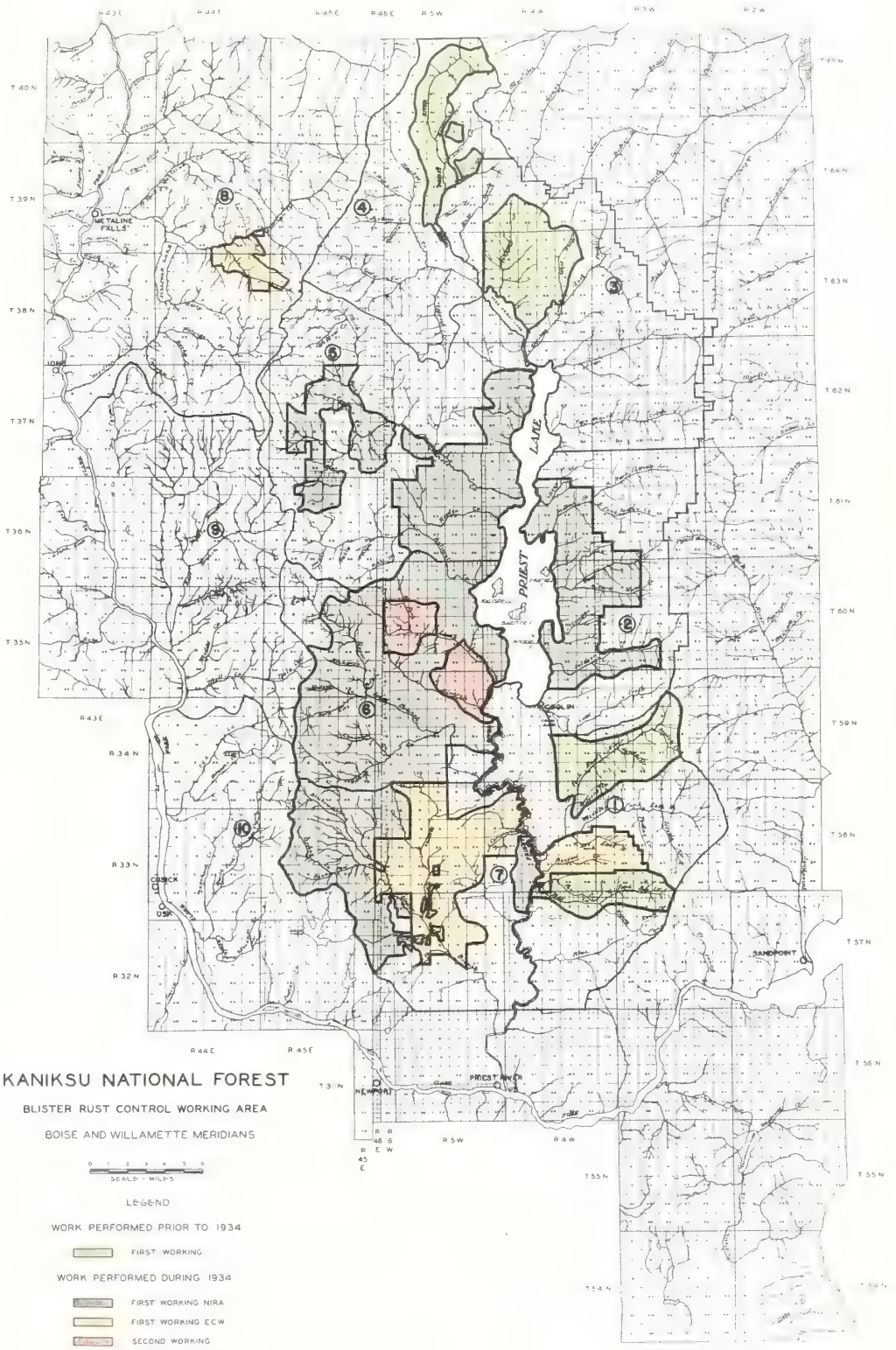
Working	Number of Acres Worked by Ownership Classes			
	Federal	State-Idaho	Private	Total
First	116,385	2,850	4,150	123,385
Second	7,124	60	1,050	8,234
All Workings	123,509	2,910	5,200	131,619

TABLE NO. 5

RESULTS OF CHECKING ON AREAS WORKED DURING 1934
COEUR D'ALENE PROJECT

Name	Eradication Type	Regular Check on Worked Areas											Area Eliminated from Crew Work								Summary		
				Ribes per Acre											Ribes per Acre								
		Acres in Checked Area	Acres Checked	Ribes lacustre		Ribes viscosissimum		Ribes inerme		All Species		Seedlings	Acres in Checked Area	Acres Checked	Ribes lacustre		Ribes viscosissimum		All Species		Total Acres in Checked area	Total Acres Checked	Per cent Check
				Bu.	L.S.	Bu.	L.S.	Bu.	L.S.	Bu.	L.S.				Bu.	L.S.	Bu.	L.S.	Bu.	L.S.			
ECW	Open Reproduction	11,177	447	2	9	1	4	1	1	4	14	1	1,642	66	10	51	1	2	11	53	12,819	513	4.0
	Dense Reproduction	1,152	46	4	20					4	20	1	1,004	40	1	5			1	5	2,186	86	3.9
	Open Pole	3,363	134	1	6	1	2			2	8	1	430	17	1	5	1	1	2	6	3,793	151	4.0
	Dense Pole	531	23	1	3	1	1			2	4	1	697	28							1,228	51	4.2
	Open Mature	16,462	639	2	9	1	2			3	11	1	2,081	84	1	5	1	1	2	6	18,543	723	3.9
	Dense Mature	1,027	41	1	9	1	1			2	10	1	2,184	86	1	1			1	1	3,211	129	4.0
	Cut Over	826	34	4	18	1	3			5	21	2									826	34	4.1
	Brush	1,626	64	2	6	2	4			4	10	2	671	27	1	4	1	1	2	5	2,297	91	4.0
	Burn	145	6	1	3					1	3	1	80	3	1	1			1	1	225	9	4.0
	Subalpine	102	4			1	3			1	3										102	4	3.9
	All Upland	36,441	1,438	2		1	3	1	1	4	13	1	8,789	353	2	12	1	1	3	13	45,230	1,791	4.0
	Stream	3,201	413	4	9	1	1	1	4	6	14	2									3,201	413	12.9
NIRA	Open Reproduction	7,036	275	2	10	2	6			4	16	1	238	9	1	1	1	1	2	2	7,274	284	3.9
	Dense Reproduction	1,107	46	2	8	1	2			3	10	1									1,107	46	4.2
	Open Pole	7,190	278	1	6	1	5			2	11	1	2,102	84	1	4	1	2	2	6	9,292	362	3.9
	Dense Pole	1,012	41	1	4	1	2			2	6										1,012	41	4.1
	Open Mature	46,268	1,819	2	10	1	2			3	12	1	9,897	396	1	9	1	1	2	10	56,165	2,215	3.9
	Dense Mature	431	18	1	4	1	5			2	9		856	35	1	3			1	3	1,287	53	4.1
	Cut Over	3,648	149	4	16	1	3			5	19	1									3,648	149	4.1
	Brush	693	28	2	9	1	5			3	14	1									693	28	4.0
	Burn	279	11	6	13	3	6			9	19	13									279	11	3.9
	Subalpine	115	4	4	14	1	4			5	18	1	244	9							359	13	3.6
	All Upland	67,779	2,669	2	10	1	3			3	13	1	13,337	533	1	7	1	1	2	9	81,116	3,202	3.9
	Stream	1,922	499	4	11	1	1	1	1	6	13	1									1,922	499	25.9
ECW and NIRA	Open Reproduction	18,213	722	2	10	1	5	1	1	4	16	1	1,880	75	8	45	1	2	9	47	20,093	797	4.0
	Dense Reproduction	2,289	92	3	14	1	1			4	15	1	1,004	40	1	5			1	5	3,293	132	4.0
	Open Pole	10,553	412	1	6	1	4			2	10	1	2,532	101	1	4	1	2	2	6	13,085	513	3.9
	Dense Pole	1,543	64	1	4	1	1			2	5	1	697	28							2,240	92	4.1
	Open Mature	62,730	2,458	2	10	1	2			3	12	1	11,978	480	1	8	1	1	2	9	74,708	2,938	3.9
	Dense Mature	1,458	59	1	7	1	1			2	8		3,040	123	1	1			1	1	4,498	182	4.0
	Cut Over	4,474	183	4	16	1	3			5	19	1									4,474	183	4.1
	Brush	2,319	92	2	7	1	4			3	11	1	671	27	1	4	1	1	2	5	2,990	119	4.0
	Burn	424	17	4	10	2	4			6	14	9	80	3	1	1			1	1	504	20	4.0
	Subalpine	217	8	2	7	1	3			3	10	1	244	9							461	17	3.7
	All Upland	104,220	4,107	2	9	1	3	1	1	4	13	1	22,126	886	1	9	1	1	2	10	126,346	4,993	4.0
	Stream	5,123	912	4	10	1	1	1	2	6	13	1									5,123	912	17.8

Annual Report 1934
Albert L. Pence



ANNUAL REPORT 1934
F.O. WALTERS

RIBES ERADICATION - KANIKSU PROJECT, 1934

By
Frank O. Walters, Agent
Division of Plant Disease Control
and
A. N. Cochrell, Ass't Forest Supervisor
U. S. Forest Service

INTRODUCTION

The Kaniksu National Forest was the scene of the first Ribes eradication work in the Inland Empire. Experimental work was started in 1923. In this year a small crew worked on Benton Creek on the Priest River Experimental Forest. In 1924, three 25-man camps operated in the Upper Priest River Valley. Work was continued on the same area in 1925 with two 25-man camps. In 1926, work was started in the Lamb and Binarch Creek drainages with three 25-man camps. In 1928, a small crew did experimental reeradication work on the areas covered in 1926.

Cooperative eradication work was begun on the Priest Lake Timber Protective Association lands in 1928 with a 25-man camp on Big Creek. Work was continued in 1931 on the North Fork of East River with two 25-man camps. In 1932 three 25-man camps worked on the east side of Upper Priest Lake in the Caribou and Trapper Creek drainages.

In 1934, Ribes eradication work was resumed on a large scale. The four agencies expending funds for eradication work in 1934 were, the Forest Service, State of Idaho, State of Washington, and the Bureau of Entomology and Plant Quarantine. The Forest Service supplied all the funds used in the operation of their 22 camps, the Bureau of Entomology and Plant Quarantine providing such technical supervision as operation supervisor, assistant operation supervisor and checking supervisor. The State of Idaho contributed funds which were expended for laborers' wages in four state camps. The funds necessary for subsistence, transportation and salaries of the technical supervisors in these state camps were supplied by the Bureau of Entomology and Plant Quarantine. Six camps were operated in Washington entirely on funds furnished by the Bureau of Entomology and Plant Quarantine. Ten camps were operated in Washington for a five-week period with funds set up by the Washington Emergency Relief Administration. These funds were used only for subsistence and for laborers' wages; other expenses were borne by the Forest Service and Bureau of Entomology and Plant Quarantine. In Idaho 3 camps operated over a four-week period on funds from the Idaho Emergency Relief Administration. These funds provided subsistence and laborers' wages. The Forest Service paid all other expenses from NIRA funds.

LOCATION AND DESCRIPTION OF THE AREAS

Work was done on three separate areas in 1934. The largest was the general area on the west side of Priest River Valley from the Falls Ranger Station north to Granite and Beaver Creeks and lying between the Clark Fork divide on the west and Priest River and Priest Lake on the east. The northern portion of this area was composed largely of young reproduction and represented a difficult eradication problem. The larger part of the area presented light to medium working conditions, the timber stands being predominately pole and mature. The entire Experimental Forest was also protected; working conditions were light to medium and the timber largely pole and mature. These areas were largely National Forest lands.

P-1551. Condition of ground following bulldozer work, under cultivation as formerly.

By

Division of Plant Disease Control

and

U. S. Forest Service

The Kaniksu National Forest was the scene of the first Ribes eradication work in the Inland Empire. Experimental work was started in 1924, when a small crew worked on Benton Creek on the Priest River Experimental Forest. In 1924, three 25-man camps operated in the Upper Priest River Valley. Work was continued on the same area in 1925 with two 25-man camps. In 1926, work was started in the Round and Blanco Creek drainage with three 25-man camps. In 1926, a small crew did experimental reeradication work on the areas covered in 1926.

Cooperative eradication work was begun on the Priest Lake Timber Protective Association lands in 1928 with a 25-man camp on Big Creek. Work was continued in 1931 on the North Fork of East River with two 25-man camps. In 1932 three 25-man camps worked on the east side of Upper Priest Lake in the Caribou and Trapper Creek drainages.

In 1934, Ribes eradication work was resumed on a large scale. The four agencies expending funds for eradication work in 1934 were, the Forest Service, State of Idaho, State of Washington, and the Bureau of Entomology and Plant Quarantine. The Forest Service supplied all the funds used in the operation of their 22 camps, the Bureau of Entomology and Plant Quarantine providing such technical supervision as operation supervisor, assistant operation supervisor and checking supervisor. The State of Idaho contributed funds which were expended for laborers' wages in four state camps. The funds necessary for subsistence, transportation and salaries of the technical supervisors in these state camps were supplied by the Bureau of Entomology and Plant Quarantine. Six camps were operated in Washington entirely on funds furnished by the Bureau of Entomology and Plant Quarantine. Ten camps were operated in Washington for a five-week period with funds set up by the Washington Emergency Relief Administration. These funds were used only for subsistence and for laborers' wages. Ribes eradication in the Forest Service and Bureau of Entomology and Plant Quarantine camps were done by the Forest Service and Bureau of Entomology and Plant Quarantine. In Idaho 3 camps operated over a four-week period on funds furnished by the Federal Emergency Relief Administration. These funds provided subsistence and laborers' wages. The Forest Service paid all other expenses from WERA funds.

LOCATION AND DESCRIPTION OF THE AREAS

Work was done on three separate areas in 1934. The largest was the general area on the west side of Priest River lying from the Idaho-Canada boundary north to Granite and Beaver Creeks and from the Priest River drainage on the west and Priest River and Priest Lake on the east. The northern portion of this area was composed largely of young reproduction and represented a difficult eradication problem. The larger part of the area presented light to medium working conditions, the timber stands being predominately pole and mature. The entire Experimental Forest was also protected; working conditions were light to medium on the timber largely pole and mature. These areas were logged Original Virgin lands.



W-1546. Ribes inerme concentrations common in stream type on Kaniksu project. Areas such as these are worked by the bulldozer method.



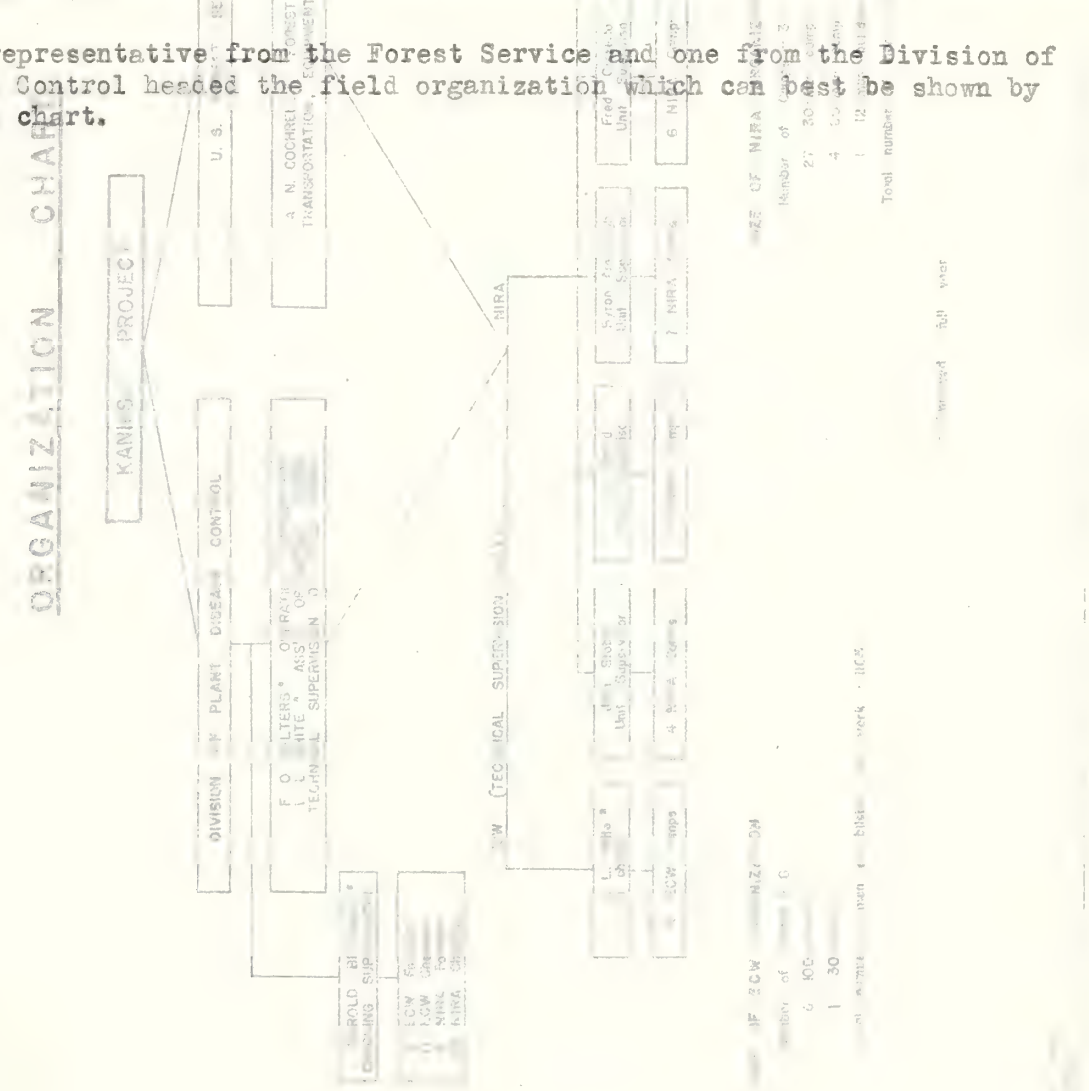
W-1551. Condition of ground following bulldozer work. Following brush burning, these areas were sown to grass or put under cultivation by farmers.

The third area worked was primarily state land located on the east side of Priest Lake, extending from the Soldier Creek drainage on the south to Bear Creek on the north. This area comprised largely pole and mature timber. Working conditions were generally light with the exception of two areas where working conditions were heavy.

ORGANIZATION AND ADMINISTRATION

The Dalkena Landing Camp which was conveniently located to the work, served as an administrative headquarters and supply base for the project. From there supplies were dispatched directly by truck to all camps located on roads and to several packing stations from which the more remote camps were supplied by pack train. Two warehouse men and two clerks handled the supplies and took care of the necessary paper work.

A representative from the Forest Service and one from the Division of Plant Disease Control headed the field organization which can best be shown by the following chart.



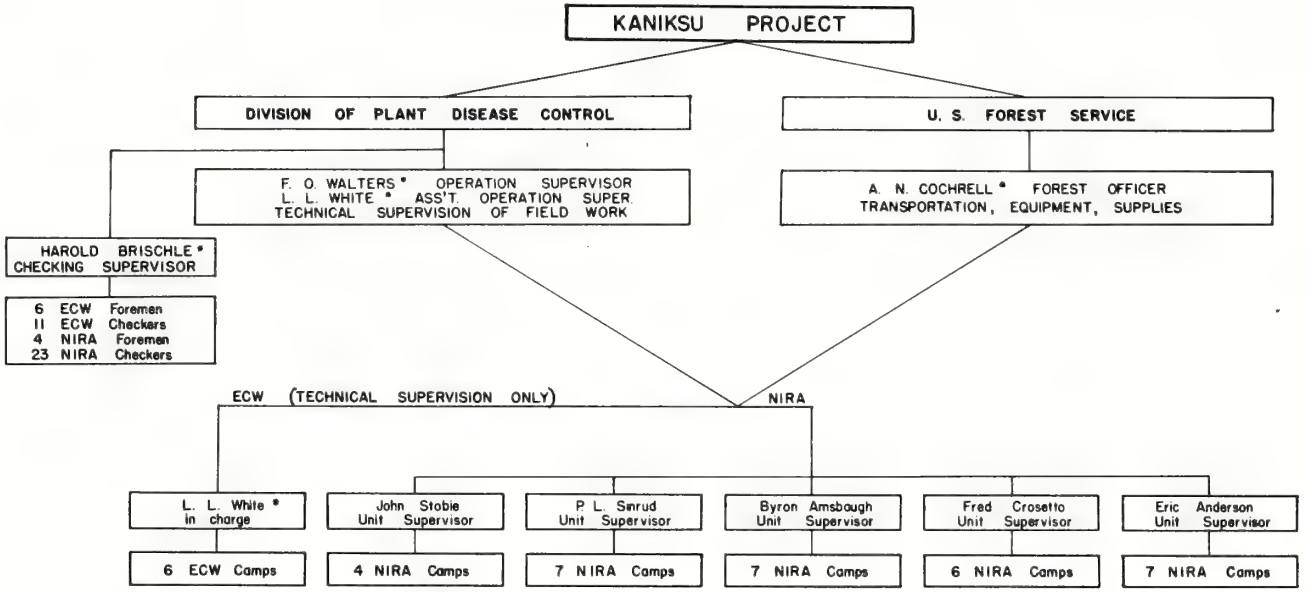
The third area worked was primarily state land located on the east side of Priest Lake, extending from the Soldier Creek drainage on the south to Deer Creek on the north. This area comprised largely pole and mature timber. Working conditions were generally light with the exception of two areas where working conditions were heavy.

ORGANIZATION AND ADMINISTRATION

The Dalkena Landing Camp which was conveniently located to the work, served as an administrative headquarters and supply base for the project. From there supplies were dispatched directly by truck to all camps located on roads and by several packing stations from which the more remote camps were supplied by pack train. Two warehouse men and two clerks handled the supplies and took care of the necessary paper work.

A representative from the Forest Service and one from the Division of Plant Disease Control headed the field organization which can best be shown by the following chart.

ORGANIZATION CHART



SIZE OF ECW ORGANIZATION

Number of Camps - 6
5 100 percent
1 30 percent
Total number of men on blister rust work - 1105

SIZE OF NIRA ORGANIZATION

Number of Camps - 32
27 30-man camps
4 60-man camps
1 12-man bulldozer camp
Total number of men on blister rust work - 1119

* Employed full year

ANNUAL REPORT 1934
F. O. WALTERS

WOW.

1106

An unusually high type of personnel comprised most of this year's CCC companies. The majority of the men were from Kentucky with the balance from Ohio, Indiana, and Illinois. A considerable area was covered in an efficient manner.

The men in the NIRA camps were of the average labor type. The men sent out by the IERA and WERA were distinctly below the average.

METHODS AND EQUIPMENT

A training school was held prior to the actual field season where instruction was given in field methods and general procedure for making maps and keeping records. The general program was to take up the various methods in the form of a lecture in a morning session followed by actual field practice during the afternoon.

The methods of Ribes eradication employed were hand pulling, slashing, and bulldozer work. The principal tool used in upland work was the trench pick. Pulaski tools were used in dense brush and heavy Ribes concentrations and almost entirely in difficult stream type conditions. Three-man crews were the rule in all NIRA camps, and were used in the CCC camps to a large extent. However, it was necessary in some CCC camps to use 5-man crews due to a lack of proficient crew leaders. On most areas of heavy Ribes concentrations string lanes were laid in advance.

It was necessary to slash some of the heavier stream type areas. Axes and Pulaskis were used and the brush either windrowed or placed in conical piles. Care was exercised to remove all possible Ribes roots. The brush was burned in the fall with the advent of proper burning conditions. When stream type conditions were extremely difficult and hand methods impractical, a bulldozer was used to remove and pile the brush. This left a clean soil surface on which grass seed was sown after the brush had been burned in the fall.

CHECKING

The checking organization worked in cooperation with the eradication forces and furnished information showing the location and amount of Ribes by number and amount of live stem remaining on areas completed by the eradication crews. On certain areas known to be relatively free of Ribes a check was made in advance of eradication work thus showing the distribution of bushes and enabling areas low in Ribes population to be eliminated from crew work.

A parallel strip method of checking was used, the strips 1/5 chain wide were run in cardinal directions at 5-chain intervals for a four percent check, and at two and one-half chain intervals for an eight percent check. Over the major portion of the upland area a four percent check was made, in stream type an eight percent check.

It was the duty of the checking organization to present the Ribes picture of an area in the best possible manner and to cooperate and assist the eradication forces in all ways possible. When no areas were available for checking, checkers were engaged in eradication activities designated by the camp foreman. During the 1934 season, checkers in ECW camps contributed 14 percent of their time to eradication activities and fire fighting. NIRA checkers had a considerably

Indiana, and Illinois. A considerable area was covered in an efficient manner.

The men in the NIRA camps were of the average labor type. The men sent out by the IERA and WERA were distinctly below the average.

[illegible] AND EQUIPMENT

A training school was held prior to the actual field season where instruction was given in field methods and general procedure for making maps and keeping records. The general program was to take up the various methods in the [illegible] form of a lecture in the morning each to be followed by actual [illegible] the afternoon.

The methods of Ribes eradication employed were hand pulling, slashing, and bulldozer work. The principal tool used in upland work was the trench pick. [illegible] entirely in difficult stream type conditions. Three-man crews were the rule in [illegible] was necessary in some CCC camps to use 5-man crews due to a lack of proficient crew leaders. On most areas of heavy Ribes concentrations string lines were laid in advance.

It was necessary to clean some of the heavier stream type areas. Axes and Pulaskis were used and the brush either windrowed or placed in conical piles. Care was exercised to remove all possible Ribes roots. The brush was burned in the fall with the advent of proper burning conditions. When stream type conditions were extremely difficult and hand methods impractical, a bulldozer was used to remove and pile the brush. This left a clean soil surface on which grass seed was sown after the brush had been burned in the fall.

[illegible]

The checking organization worked in cooperation with the eradication [illegible] by [illegible] number and names of live stem resprouts or seeds germinated by the eradication crews. On certain areas known to be relatively free of Ribes a check was made in advance of eradication work thus showing the distribution of Ribes and [illegible] sprouting areas low in Ribes population to be eliminated from crew work.

A partial strip method of checking was used, the strips 1/5 chain wide [illegible] at two and one-half chain intervals for an eight percent check. Over the major [illegible] portion of the upland area a four percent check was made. [illegible] percent check.

It was the duty of the checking organization to present the Ribes picture of an area in the best possible manner and to cooperate and assist the eradication forces in all ways possible. When no areas were available for checking, checkers were engaged in eradication activities determined by the crew foreman. During the 1934 season, checkers in RIA camps established 14 percent of their time to eradication activities and fire fighting. [illegible]



A-93. Upper left - stream type before bulldozer work. Center - brush in windrows following bulldozer work. Right - conical brush piles following hand slashing work. Official photograph, 116th Photo Section, W.N.G.

Annual Report 1934
F. O. Walters

greater area to cover and were able to contribute only one percent of their time to eradication work.

The ECW checking forces covered 39,473 acres at a cost of $.143 per acre while checkers in NIRA camps covered 167,036 acres at a cost of $.09 per acre; the cost for the combined ECW and NIRA operations averaged $.10 per acre.

PREERADICATION

At the close of the eradication work, a party of 11 men covered an area of 312,920 acres to determine the extent of the white pine and estimate the work involved in protecting the pine existing thereon. On the Kaniksu side of the forest, the Upper Kalispell and Diamond Creeks, and the Middle Fork of East River were inspected. The balance of the work was done on the Pend Oreille side of the forest including the inspections of Deep Creek and tributaries, Pack River and the drainages south to Reilly Creek, Rock, Boulder, Rapid Lightning, Grouse, Trout, Trestle and Johnson Creeks.

Because of the large amount of country to be inspected, it was necessary for each man to cover extensively by a scouting method an area of about two sections each day.

Only a small amount of country remains to be inspected and can be covered by the permanent men assigned to the Kaniksu project.

STATEMENT OF EXPENDITURES AND COSTS

The statement of expenditures and costs includes those funds expended from NIRA allotments to the U. S. Forest Service and the Bureau of Entomology and Plant Quarantine in addition to funds disbursed from regular appropriations allotted to these organizations for blister rust control work. They also include funds contributed by cooperating agencies.

No costs are available for ECW work except those incurred by the U. S. Forest Service and Bureau of Entomology and Plant Quarantine in the course of providing technical supervision to ECW work. These expenses were paid from NIRA funds and are shown in Table No. 2 under "Cooperation with ECW."

The ECW checking forces covered 39,475 acres at a cost of $.145 per acre; the cost for the combined ECW and NIRA operations averaged $.10 per acre.

At the close of the eradication work, a party of 11 men covered an area of 112,920 acres to determine the extent of the white pine weevil damage involved in protecting the pine existing thereon. On the Santiam side of the Cascades, the Upper Kalispell and Diamond Creeks, and the Middle Fork of Trail River drainages south to Neilly Creek, Hook, Boulder, Hazel Lightning, Grouse, Trout, Trestle and Johnson Creeks.

Because of the large amount of country to be inspected, it was necessary for each man to cover extensively by a scouting method an area of about two sections each day.

Only a small amount of country remains to be inspected and can be covered by the permanent men assigned to the Kamikan project.

The statement of expenditures and costs includes those funds expended from NIRA allotments to the U. S. Forest Service and the Bureau of Entomology allotted to these organizations for blister rust control work. They also include funds contributed by cooperating agencies.

No costs are available for ECW work except those incurred by the U. S. funds and are shown in Table No. 2 under "Cooperation with ECW."

TABLE NO. 1

EXPENDITURES BY APPROPRIATION

Cooperating Agency	Appropriation	Amount
Forest Service	Impnira	$312,070.11
	Lieunira	1,425.00
	Total	313,495.11
Bureau of Entomology and Plant Quarantine	Regular (B.P.I.) Idaho	1,194.22
	Regular (B.P.I.) Wash.	668.52
	Nira - Idaho	32,295.52
	Nira - Washington	76,511.55
	Total	110,609.81
Other Cooperative Funds	State of Idaho	29,154.06
	IERA	3,785.14
	WERA	19,743.41
	Total	52,682.61
Total Expenditures		$476,787.53

TABLE NO. 2

CLASSIFIED EXPENDITURES

Item	NIRA	Cooperation with ECW	Total
Salaries, permanent men	$ 8,832.82	$3,358.29	$ 12,191.11
Wages, temporary men	348,920.94		348,920.94
Subsistence supplies	48,674.25		48,674.25
Equipment	39,130.33		39,130.33
Other Supplies	14,397.43		14,397.43
Transportation and travel	13,214.07	259.40	13,473.47
Total Expenditures	473,169.84	3,617.69	476,787.53
Less 2/3 cost of new equipment and tools	26,824.38		26,824.38
Less cost of unused 1934 supplies	1,350.00		1,350.00
Plus 1/3 cost of 1932-33 equipment and trucks	2,945.03		2,945.03
Plus cost of 1933 preeradication	2,007.50		2,007.50
Net cost 1934 operations	$446,947.99	$3,617.69	$450,565.68

Additional cost information:

Effective man-day cost - NIRA (hand eradication)	$ 7.72
Cost of bulldozer work	$11,371.55
Food cost per man-day - NIRA	.50
Pounds of twine used - NIRA and ECW - 19,747. cost	$ 5,324.10

TABLE NO. 2

	Imputta		$312,070.11
	Ilsumita		1,425.00
Local Service	Total		73,495.11
	Chester	Ref.	Trade
	Agent-P	[illegible]	Trac.
Bureau of Investigation	Alta - Trade		[illegible]
and	Mita - Washington		76,811.55
Adjustments	Total		110,009.81
	State of Idaho		29,184.05
	IMRA		5,795.14
Other Conservation	[illegible]		11,716.41
Trade	[illegible]		[illegible]
Total Appropriations			[illegible]

TABLE NO. 3

Classified Assignments

	MIRA	Cooperation with ECM	Total
Salaries, permanent work	$ 5,476.42	$4,995.80	$ [illegible]
Wages, temporary work	[illegible]		[illegible]
Wages, temporary aid	[illegible]		[illegible]
Equipment	[illegible]		[illegible]
Other Supplies	[illegible]		[illegible]
Transportation and travel	[illegible]	[illegible]	[illegible]
Total Expenditures	[illegible]	4,317.68	[illegible]
Over 3/5 cost of new equipment			
and tools	[illegible]		[illegible]
Less cost of unused [illegible]	[illegible]		[illegible]
Plus 1/3 cost of 1952-53			
Equipment and trucks	2,945.08		5,340.08
Less cost of [illegible]	[illegible]		[illegible]
Net cost 1953 operations	[illegible]		[illegible]

Additional cost information:

Effective man-day cost - MIRA (Hand eradication)	$ 7.72
Cost of bulldozer work	$11,872.85
Food cost per man-day - MIRA	.60
Pounds of twine used - MIRA and ECM - 19,787. cost	$ 5,934.10

SUMMARY OF RIBES ERADICATION 1934
KANIKSU PROJECT

TABLE NO. 3

SUMMARY OF ALL WORKINGS

Name	Eradication Type	Acres First Working	Acres Second Working	Total Effective Man Days	Total Ribes	Total Cost
ECW Camps	Open Reproduction	11,013		6,233	1,860,360	
	Dense Reproduction	839		1,541	100,769	
	Open Pole	5,156		954	141,620	
	Dense Pole	4,578		587	72,586	
	Open Mature	8,823		3,362	348,830	
	Dense Mature	3,555		731	69,309	
	Cut Over	1,509		683	101,640	
	Brush	1,022		494	168,225	
	Burn	450		807	507,371	
	Subalpine	232		54	1,194	
	All Upland	37,177		15,446	3,371,904	
	Stream (hand)	2,141		5,819	1,007,006	
	Stream (slash)	342		3,370		
	All Stream	2,483		9,189	1,007,006	
	All Types	39,660		24,635	4,378,910	
NIRA Camps	Open Reproduction	39,796	815	16,889	7,550,723	$130,368.90
	Dense Reproduction	9,707	590	3,142	645,301	24,253.56
	Open Pole	42,008	5,635	11,599	2,185,013	89,534.42
	Dense Pole	9,170	1,033	1,938	208,809	14,959.70
	Open Mature	38,205	147	8,963	2,277,130	69,186.74
	Dense Mature	10,823		1,532	156,934	11,825.73
	Cut Over	799		286	43,673	2,207.67
	Brush	1,887		567	158,719	4,376.75
	Burn	625		452	410,182	3,489.05
	Subalpine	38		39	28,342	301.04
	All Upland	153,058	8,220	45,407	13,664,826	350,503.56
	Stream (hand)	5,434	324	9,594	3,366,235	74,057.59
	Stream (slash)	214		1,427		11,015.25
	Stream (machine)	243		1,035		11,371.59
	All Stream	5,891	324	12,056	3,366,235	96,444.43
	All Types	158,949	8,544	57,463	17,031,061	$446,947.99
ECW and NIRA Camps	Open Reproduction	50,809	815	23,122	9,411,083	
	Dense Reproduction	10,546	590	4,683	746,070	
	Open Pole	47,164	5,635	12,553	2,326,633	
	Dense Pole	13,748	1,033	2,525	281,395	
	Open Mature	47,028	147	12,325	2,625,960	
	Dense Mature	14,378		2,263	226,243	
	Cut Over	2,308		969	145,313	
	Brush	2,909		1,061	326,944	
	Burn	1,075		1,259	917,553	
	Subalpine	270		93	29,536	
	All Upland	190,235	8,220	60,853	17,036,730	
	Stream (hand)	7,575	324	15,413	4,373,241	
	Stream (slash)	556		4,797		
	Stream (machine)	243		1,035		
	All Stream	8,374	324	21,245	4,373,241	
	All Types	198,609	8,544	82,098	21,409,971	

Annual Report 1934
F. O. Walters

TABLE NO. 3A

FIRST WORKING

Name	Eradication Type	Acres	Effective Man Days	Total Ribes	Total Cost	Per Acre Basis Man Days	Ribes	Cost
ECW Camps	Open Reproduction	11,013	6,233	1,860,360		.57	169	
	Dense Reproduction	839	1,541	100,769		1.84	120	
	Open Pole	5,156	954	141,620		.19	27	
	Dense Pole	4,579	587	72,586		.13	16	
	Open Mature	8,823	3,362	348,830		.38	40	
	Dense Mature	3,555	731	69,309		.21	19	
	Cut Over	1,509	683	101,640		.45	67	
	Brush	1,022	494	168,225		.48	165	
	Burn	450	807	507,371		1.79	1,127	
	Subalpine	232	54	1,194		.23	5	
	All Upland	37,177	15,446	3,371,904		.42	91	
	Stream (hand)	2,141	5,819	1,007,006		2.72	470	
	Stream (slash)	342	3,370			9.85		
	All Stream	2,483	9,189	1,007,006		3.70	406	
	All Types	39,660	24,635	4,378,910		.62	110	
NIRA Camps	Open Reproduction	39,796	16,720	7,539,093	$129,064.34	.42	189	$ 3.24
	Dense Reproduction	9,707	3,062	636,433	23,636.03	.32	66	2.43
	Open Pole	42,008	10,483	2,107,273	80,919.85	.25	50	1.93
	Dense Pole	9,170	1,735	189,676	13,392.72	.19	21	1.46
	Open Mature	38,205	8,926	2,269,708	68,901.13	.23	59	1.80
	Dense Mature	10,823	1,532	156,934	11,825.73	.14	15	1.09
	Cut Over	799	286	43,673	2,207.67	.36	55	2.76
	Brush	1,887	567	158,719	4,376.75	.30	84	2.32
	Burn	625	452	410,182	3,489.05	.72	656	5.58
	Subalpine	38	39	28,342	301.04	1.03	746	7.92
	All Upland	153,058	43,802	13,540,033	338,114.31	.29	88	2.21
	Stream (hand)	5,434	9,148	3,198,370	70,614.85	1.68	589	13.00
	Stream (slash)	214	1,427		11,015.25	6.67		51.47
	Stream (machine)	243	1,035		11,371.59	4.26	*	46.80
	All Stream	5,891	11,610	3,198,370	93,001.69	1.97	543	15.79
	All Types	158,949	55,412	16,738,403	$431,116.00	.35	105	$ 2.71
ECW and NIRA Camps	Open Reproduction	50,809	22,953	9,399,453		.45	185	
	Dense Reproduction	10,546	4,603	737,202		.44	70	
	Open Pole	47,164	11,437	2,248,893		.24	48	
	Dense Pole	13,748	2,322	262,262		.17	19	
	Open Mature	47,028	12,288	2,613,538		.26	56	
	Dense Mature	14,378	2,263	226,243		.16	16	
	Cut Over	2,308	969	145,313		.42	63	
	Brush	2,909	1,061	326,944		.36	112	
	Burn	1,075	1,259	917,553		1.17	854	
	Subalpine	270	93	29,536		.34	109	
	All Upland	190,235	59,248	16,911,937		.31	89	
	Stream (hand)	7,575	14,967	4,205,376		1.98	555	
	Stream (slash)	556	4,797			8.63		
	Stream (machine)	243	1,035			4.26	*	
	All Stream	8,374	20,799	4,205,376		2.48	502	
	All Types	198,609	80,047	21,117,313		.40	106	

TABLE NO. 3B

SECOND WORKING

Name	Eradication Type	Acres	Effective Man Days	Total Ribes	Total Cost	Per Acre Basis Man Days	Ribes	Cost
NIRA Camps	Open Reproduction	815	169	11,630	$ 1,304.56	.21	14	$1.60
	Dense Reproduction	590	80	8,868	617.53	.14	15	1.05
	Open Pole	5,635	1,116	77,740	8,614.57	.20	14	1.53
	Dense Pole	1,033	203	19,133	1,566.98	.20	19	1.52
	Open Mature	147	37	7,422	285.61	.25	50	1.94
	All Upland	8,220	1,605	124,793	12,389.25	.20	15	1.51
	Stream (hand)	324	446	167,865	3,442.74	1.38	518	10.63
	All Types	8,544	2,051	292,658	$15,831.99	.24	34	$1.85

*5.12 machine hours per acre.

TABLE NO. 4

OWNERSHIP OF LAND COVERED ON WEEVIL ERADICATION 1934
KANIKSU PROJECT

Working	No. of Acres Worked by Ownership Classes				Total Acres
	Federal	State		Private	
		Idaho	Wash.		
First	120,595	19,604	1,780	56,630	198,609
Second	7,864			680	8,544
All Workings	128,459	19,604	1,780	57,310	207,153

Working					
All Workings		18,604	1,750	32,570	207,165

TABLE NO. 5

RESULTS OF CHECKING ON AREAS WORKED DURING 1934
KANIKSU PROJECT

Name	Eradication Type	Regular Check on Worked Areas											Area Eliminated from Crew Work				Summary		
				Ribes Per Acre											Ribes Per Acre				
				Ribes lacustre		Ribes visco-sissimum		Ribes inerme		All Species					Ribes lacustre				
		Acres in Checked Area	Acres Checked	Bushes	Live Stem	Bushes	Live Stem	Bushes	Live Stem	Bushes	Live Stem	Seed-lings	Acres in Checked Area	Acres Checked	Bushes	Live Stem	Total Acres in Checked Area	Total Acres Checked	Per Cent Check
ECW	Open Reproduction	10,667	457	1	4	1	2	1	1	3	7	1	346	14	1	4	10,667	471	4.4
	Dense Reproduction	839	31	2	12	1	1	1	1	4	14	1					839	31	3.7
	Open Pole	5,156	209	1	3	1	1	1	1	3	5	1					5,156	209	4.0
	Dense Pole	4,733	189	1	4	1	1	1	2	3	7	1					4,733	189	4.0
	Open Mature	8,823	319	1	5	1	3	1	1	3	9	1					8,823	319	3.6
	Dense Mature	3,555	145	1	2	1	1	1	1	3	4	1					3,555	145	4.1
	Cut Over	1,509	62	1	4	2	5	1	1	4	10	1					1,509	62	4.1
	Brush	1,022	40	1	7	1	3	1	1	3	11	1					1,022	40	3.9
	Burn	450	18	1	2					1	2	1					450	18	4.0
	Subalpine	232	9	1	5					1	5						232	9	3.9
	All Upland	36,986	1,479	1	4	1	2	1	1	3	7	1	346	14	1	4	37,332	1,493	4.0
	Stream	2,141	303	4	11	1	1	1	3	6	15	1					2,141	303	14.0
NIRA	Open Reproduction	39,816	1,252	1	5	1	2	1	1	3	8	1	795	33	1	1	40,611	1,285	3.2
	Dense Reproduction	10,297	303	1	5	1	3	1	1	3	9	1					10,297	303	2.9
	Open Pole	47,558	1,353	1	4	1	2	1	1	3	7	1	85	4			47,643	1,357	2.9
	Dense Pole	10,203	249	1	3	1	1	1	1	3	5	1					10,203	249	2.4
	Open Mature	38,352	1,113	1	5	1	1	1	1	3	7	1					38,352	1,113	2.9
	Dense Mature	10,823	320	1	3	1	1	1	1	3	5	1					10,823	320	3.0
	Cut Over	799	30	1	5	1	1	1	4	3	10	1					799	30	3.8
	Brush	1,743	55	1	2	1	2	1	1	3	5	1	144	5			1,887	60	3.2
	Burn	625	23	1	1	2	6			3	7	2					625	23	3.7
	Subalpine	38	2	3	8	3	5			6	13	7					38	2	5.3
	All Upland	160,254	4,700	1	4	1	2	1	1	3	7	1	1,024	42	1	1	161,278	4,742	2.9
	Stream	5,758	1,183	2	7	1	1	1	1	4	9	1					5,758	1,183	20.6
ECW and NIRA	Open Reproduction	50,483	1,709	1	5	1	2	1	1	3	8	1	1,141	47	1	2	51,624	1,756	3.4
	Dense Reproduction	11,136	334	1	6	1	3	1	1	3	10	1					11,136	334	3.0
	Open Pole	52,714	1,562	1	4	1	2	1	1	3	7	1	85	4			52,799	1,566	3.0
	Dense Pole	14,936	438	1	3	1	1	1	1	3	5	1					14,936	438	2.9
	Open Mature	47,175	1,432	1	5	1	1	1	1	3	7	1					47,175	1,432	3.0
	Dense Mature	14,378	465	1	3	1	1	1	1	3	5	1					14,378	465	3.2
	Cut Over	2,308	92	1	4	1	4	1	2	3	10	1					2,308	92	4.0
	Brush	2,765	95	1	4	1	2	1	1	3	7	1	144	5			2,909	100	3.4
	Burn	1,075	41	1	2	1	4			2	6	1					1,075	41	3.8
	Subalpine	270	11	1	6	1	1			2	7	1					270	11	4.1
	All Upland	197,240	6,179	1	4	1	2	1	1	3	7	1	1,370	56	1	2	198,610	6,235	3.1
	Stream	7,899	1,486	2	7	1	1	1	1	4	9	1					7,899	1,486	18.8

Annual Report 1934
H. A. Brischle

BLISTER RUST CONTROL WORK IN WASHINGTON
1934

Work in Washington consisted of continuance of local control operations in Mount Rainier National Park, scouting for the disease in various parts of the state, and as usual the maintenance of the Western field office in Spokane. No special memorandum of understanding was executed with any state or private agencies to cover this work. Despite this fact, the customary cooperative relations were maintained with the Washington State Department of Agriculture and the State Forester's office.

RIBES ERADICATION, MOUNT RAINIER NATIONAL PARK, 1934

By
Harry F. Geil
Agent

INTRODUCTION

Ribes eradication work on Mount Rainier National Park during the 1934 field season was performed out of two ECW camps. A crew of 35 men was secured from each of these camps. It was necessary to establish a spike camp closer to the area for one of the crews while engaged on Ribes eradication work.

ORGANIZATION

A representative of the Division of Plant Disease Control assisted in starting the work. One man with previous experience in blister rust work was employed by the Division as a unit supervisor to direct the work of the two 35-man crews. Two technical foreman who were forestry school graduates were selected by the Park Service to give immediate supervision to these crews.

LOCATION AND DESCRIPTION OF AREAS

Ribes eradication work was performed on 1,102 acres on the White River area located on the east side of the Park. Although both upland and stream types were worked, nearly all the Ribes were found along small streams and on seepages on the benches. Since these conditions existed over so much of the area, it was classed as stream type. The major portion of the work consisted in reworking areas covered in past years. The large number of Ribes found was due to extending and rounding out the protection zone beyond the limits of the area previously worked.

Initial Ribes eradication was performed on 38 acres along Stevens Creek on the Muddy Fork Cowlitz River area on the west side of the Park. This area was on a bench above the river where many small drainages came down from the hillside. Alder and willow formed the principal ground cover, intermingled with heavy concentrations of R. bracteosum. On this area, both Ribes and white pines were heavily infected with blister rust.

METHOD OF WORK

Hand pulling methods only were used. It was necessary to use 5-man crews because of a lack of sufficient number of experienced crew leaders to put in charge of a larger number of 3-man crews.

The efficiency of the work was checked by the technical foreman and unit supervisor.

By

Harry P. Gail

Agent

INTRODUCTION

Ribes eradication work on Mount Rainier National Park during the 1934 field season was carried out by two crews. It was undertaken in order to protect the white pine stands in the vicinity of the Nisqually entrance, the Longmire camp, and the Paradise camp. Ribes eradication had been carried on in the Nisqually entrance area for several years, but the Longmire and Paradise areas had not been worked since 1931.

ORGANIZATION

A representative of the Division of Plant Disease Control assisted in starting the work. One man with previous experience in blister rust work was employed by the Division as a unit supervisor to direct the work of the two 35-man crews. Two technical foremen who were forestry school graduates were selected by the Park Service to give immediate supervision to these crews.

LOCATION AND DESCRIPTION OF AREAS

Ribes eradication work was performed on 1,102 acres on the White River area located on the east side of the Park. Although both upland and stream types were worked, [illegible] on seepages on the benches. Since these conditions existed over so much of the area, it was classed as stream type. The major portion of the work consisted in reworking areas covered in past years. The large number of Ribes found was due to [illegible] limits of the area previously worked.

Initial Ribes eradication was performed on 38 acres along Stevens Creek on the Muddy Fork Cowlitz River area on the west side of the Park. This area was on a bench above the river where many small tributaries came down from the hillside. Alder and willow formed the principal ground cover, interwoven [illegible] with heavy concentrations of R. bracteosum. On this area, both Ribes and white pines were heavily infected with blister rust.

METHOD OF WORK

Hand pulling methods only were used. It was necessary to use 3-man crews because of a lack of sufficient number of experienced crew leaders to put in charge of a larger number of 3-man crews.

The efficiency of the work was checked by the technical foreman and unit supervisor.

SCOUTING

The unit supervisor spent a considerable amount of time scouting for blister rust infection and found it for the first time on Ribes on the east side of the Park. He also found pine infection quite generally distributed over all the Stevens Canyon and Muddy Fork Cowlitz areas.

In checking over the Longmire and Narada Falls areas which were worked in previous years, it was found that a good job of Ribes eradication had been done. It is recommended, however, that some mop-up work be done on these areas in 1935.

RESULTS OF WORK

TABLE NO. 1

RIBES ERADICATION SUMMARY, MOUNT RAINIER NATIONAL PARK, 1934

Stream Type

Area	Acres	Man Days	Ribes Pulled						Per Acre	
			R. brac.	R. lac.	R. lax.	R. visc.	R. wats.	Total	Man Days	Ribes
White River	1,102	957	2,176	166,882	1,601	3,841	2,239	176,739	.87	160
Stevens Creek	38	479	41,789					41,789	12.63	1,100
All Areas	1,140	1,436	43,965	166,882	1,601	3,841	2,239	218,528	1.30	192

The unit supervisor spent a considerable amount of time scouting for blister rust infection and found it for the first time on Ridge on the east side of the Park. He also found pine infection quite generally distributed over all the Stevens Canyon and Muddy Fork Soft Site areas.

In checking over the Longmire and Nisqually Falls areas which were worked in previous years, it was found that a good job of Ribes eradication had been done. It is recommended, however, that some mop-up work be done on these areas in 1936.

RESULTS OF WORK

Table 1.

Stream Type

Area	Acres	Net Plant	Ribes Orig.	Ribes Rec.	Ribes Rem.	Ribes Left	Ribes Per Cent	Man Hours	Acres Per Man Day	Cost Per Acre
Tahoma Silver	1,100	327	2,176	160,000	1,901	5,441	175.2		.47	.16
Stevens Canyon	40	174	41,756					49,756	1.00	1.00
All Areas	1,140	1,140	41,756	160,000	1,901	5,441	175.2	49,756	1.00	.16

BLISTER RUST CONTROL WORK IN OREGON
1934

Blister rust control activities in Oregon were continued as a cooperative project between the Bureau of Entomology and Plant Quarantine and the Bureau of Plant Industry of the State Department of Agriculture, the Oregon State Board of Forestry, and the Department of Plant Pathology of the Oregon State College. There is given below the amendment to the basic memorandum of understanding, which was drawn up to cover the cooperative work for the fiscal year 1935, beginning July 1, 1934.

AMENDMENT TO
MEMORANDUM OF UNDERSTANDING
Effective July 1, 1927
Between
THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF ENTOMOLOGY,
THE OREGON STATE BOARD OF HORTICULTURE, OREGON STATE BOARD OF FORESTRY,
AND THE OREGON STATE COLLEGE

Amendment No. 7
Spokane, Wash.

Cooperative Work in Controlling White Pine Blister Rust in Oregon.

The undersigned mutually agree that the memorandum of understanding between the United States Department of Agriculture, Bureau of Entomology, and the Oregon State Board of Horticulture, Oregon State Board of Forestry and the Oregon State College effective July 1, 1927 to continue in effect until June 30, 1928, shall be continued in full force and effect in all its provisions for the fiscal year ending June 30, 1935 with the exception of paragraphs E-1 and E-6 which shall be amended to read as follows:

E-1. That this memorandum of understanding shall take effect July 1, 1934 and continue in effect until June 30, 1935, provided that either party may terminate the agreement at any time by a written statement to that effect 30 days in advance of the date of termination desired.

E-6. That for the fiscal year July 1, 1934 to June 30, 1935 the Oregon State Board of Horticulture will expend about $2,500.00; the Oregon State Board of Forestry will expend about $1,000.00; the Oregon State College will expend about $1,750.00; and the Federal Government in behalf of the United States Department of Agriculture, Bureau of Entomology about $28,000.00, in connection with the work herein provided for.

March 26, 1934 — Chas. A. Cole
Director, Bureau of Plant Industry, State Department of Agriculture (succeeding State Board of Horticulture).

March 26, 1934 — Lynn F. Cronemiller
State Forester, Oregon State Board of Forestry.

March 27, 1934 — C. E. Owens
Plant Pathologist, Oregon State College.

July 1, 1934 — Lee A. Strong
Chief, Bureau of Entomology and Plant Quarantine, U. S. Dept. of Agriculture

BLISTER RUST CONTROL WORK IN OREGON

1934

Blister rust control activities in Oregon were continued as a cooperative project between the Bureau of Entomology and Plant Quarantine, the Bureau of Plant Industry of the U. S. Department of Agriculture, the Board of Forestry, and the Department of Plant Pathology of the Oregon State College. There is given below the agreement to the basic memorandum of understanding, which was drawn up to cover the activities carried on during the fiscal year 1933, beginning July 1, 1932.

AMENDMENT TO
MEMORANDUM OF UNDERSTANDING
Effective July 1, 1927
Between
THE UNITED STATES DEPARTMENT OF AGRICULTURE, ACTING BY THE CHIEF OF THE BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE, AND THE OREGON STATE BOARD OF FORESTRY
AND THE OREGON STATE COLLEGE

Amendment No. 7
Spokane, Wash.

Cooperative work in Control of White Pine Blister Rust is engaged in.

The undersigned mutually agree that the memorandum of understanding between the United States Department of Agriculture, Bureau of Entomology and Plant Quarantine, Bureau of Plant Industry, Oregon State Board of Forestry and the Oregon State College effective July 1, 1927 is continued in effect until June 30, 1935 unless by mutual agreement it is changed or terminated by June 30, 1934 to be amended to read as follows:

E-1. That this memorandum of understanding shall take effect July 1, 1934 and continue in effect until June 30, 1935, provided that either party may terminate this agreement at any time by a written statement by that effect in advance of the date of termination desired.

E-6. That for the fiscal year July 1, 1934 to June 30, 1935 the Oregon Forestry will expend about $3,000.00; the Oregon State College will expend about $1,750.00 and the Federal Government in behalf of the State Blister Department of Agriculture, Bureau of Entomology about $28,000.00, in connection with the work herein provided for.

March 21, 1934 — Glenn A. Cole
Director, Bureau of Plant Industry, State Department of Agriculture (succeeding State Board of Horticulture).

March 20, 1934 — [illegible]
State Forester, Oregon State Board of Forestry.

March 27, 1934 — C. I. Owens
Plant Pathologist, Oregon State College.

July 1, 1934 — [illegible]
Chief, Bureau of Entomology and Plant Quarantine, U. S. Dept. of Agriculture.

BLISTER RUST CONTROL ACTIVITIES IN OREGON DURING 1934

By
C. P. Wessela
Junior Forester

INTRODUCTION

Ribes eradication for the control of white pine blister rust was conducted on and adjacent to three national forests of Oregon during 1934. Three 32-man camps were operated on the Rogue River National Forest and adjoining areas. One 32-man camp continued control measures on the Still Creek white pine plantation within the Mt. Hood National Forest, and one 11-man camp began control activities on the Mt. Hebo 140-acre plantation of eastern white pine within the Siuslaw National Forest. The Bureau of Entomology and Plant Quarantine financed all control work on the Rogue River and Mt. Hood National Forests, and also provided technical supervision for the Mt. Hebo project. The remainder of the costs on the Mt. Hebo project was borne by the Forest Service.

Prior to 1933, initial, experimental Ribes eradication work on the upper Rogue River unit had been done on 1,834 acres of sugar and white pine type near Woodruff Meadows. Some parts of this area were reworked in 1933 when initial work was also done on 6,013 acres of adjacent land. The Still Creek area was given a complete initial working in 1931. The work of 1934 consisted of a thorough reworking of the entire control unit. Control measures on the Mt. Hebo plantation were instituted in 1934 in order to avert further damage to the planted pines. Pines along a small stream which forms the eastern boundary of the plantation, were already badly infected.

ORGANIZATION AND ADMINISTRATION

Ribes eradication in Oregon was under the general supervision of the Oakland, California Blister Rust office in conjunction with the California operation. One unit supervisor was responsible for immediate supervision of the operations. One field clerk, responsible to the unit supervisor, managed correspondence and records incidental to the project. In addition to these duties he acted as warehouseman and truck driver and also managed the immediate details of furnishing subsistence supplies to the various camps.

The Mt. Hebo operation was a cooperative project, the Bureau of Entomology and Plant Quarantine furnishing the technical supervision for Ribes eradication, while the Forest Service handled the general operation phases of the work, such as employment of labor, subsistence, equipment, transportation, and other affairs connected with the business management of the project.

All temporary employees, with the exception of 5 camp foremen and 5 checkers, were hired through the National Reemployment Service. Camp foremen and checkers were under temporary Civil Service appointment.

BLISTER RUST CONTROL ACTIVITIES IN OREGON DURING 1...

by

C. P. Wessels
Junior Forester

INTRODUCTION

Ribes eradication for the control of white pine blister rust was conducted on and adjacent to three national forests of Oregon during 1934. Three 32-man camps were operated on the Rogue River National Forest and adjoining areas. One 32-man camp continued control measures on the Still Creek white pine plantation within the Mt. Hood National Forest, and one 11-man camp began control activities on the Mt. Hebo 140-acre plantation of western white pine within the Siuslaw National Forest. The Bureau of Entomology and Plant Quarantine financed all control work on the Rogue River and Mt. Hood National Forests, and also provided technical supervision for the Mt. Hebo project. The remainder of the costs on the Mt. Hebo project was borne by the Forest Service.

Prior to 1933, initial, experimental Ribes eradication work on the upper Rogue River unit had been done on 1,864 acres of sugar and white pine type near Woodruff Meadows. Some parts of this area were reworked in 1933 when initial work was also done on 6,015 acres of adjacent land. The Still Creek area was given a complete initial working in 1931. The work of 1934 consisted of a thorough reworking of the entire control unit. Control measures on the Mt. Hebo plantation were instituted in 1934 in order to avert further damage to the planted pines. Pines along a small stream which forms the eastern boundary of the plantation, were already badly infected.

ORGANIZATION AND ADMINISTRATION

Ribes eradication in Oregon was under the general supervision of the Oakland, California Blister Rust office in conjunction with the California operation. One unit supervisor was responsible for immediate supervision of the operations. One field clerk, responsible to the unit supervisor, [illegible] to these duties he acted as watchwoman and truck driver and also managed the [illegible].

The Mt. Hebo operation was a cooperative project, the lumber of Ribes eradication, while the Forest Service handled the general operation phases of the work, such as employment of labor, subsistence, equipment, transportation, and other matters connected with the business management of the project.

All temporary employees, with the exception of 3 camp foremen and 5 checkers, were hired through the National Reemployment Service. Camp foremen and checkers were under temporary Civil Service appointment.

METHODS OF WORK

The methods used in Ribes eradication in Oregon are very similar to hand-pulling methods developed and used in Idaho and California. Detailed descriptions of these methods have been given in previous reports and manuals. In general, these established lines of procedure were followed, and only special problems encountered on the Oregon operation will be discussed here.

Special Preeradication Survey

Late in the season of 1933, a preliminary survey of the white and sugar pine stands of the upper Rogue River drainage was made. Due to the lateness of the season, only an extensive examination could be undertaken. Approximate locations of white and sugar pine stands considered of sufficient value to warrant protection from blister rust were determined and a general knowledge of Ribes conditions upon these areas obtained. In order to secure accurate records on the location of white and sugar pine, particularly the reproduction, and to obtain a working knowledge of the area necessary in conjunction with the Ribes eradication program of 1934, five trained men were put into the field early in the 1934 season. The general areas located in 1933 were systematically stripped every 10 chains. The number of feet of live stem of all Ribes on the strips was recorded. In addition to the Ribes data, all sugar and white pine trees were recorded by diameter classes of 0 to 6 inches, 7 to 12 inches, and over 12 inches. A timber type map was made of the control unit, on which was shown in color the location of (1) all white and sugar pine type, (2) types in which white and sugar pine occur but insufficient in amount to constitute a type, and (3) non-white pine types.

All Ribes and pine data were plotted on maps to serve as the basis for planning the eradication operation and delimiting work areas. Areas which appeared to be Ribes-free were also reserved from crew work to be checked more thoroughly later.

This survey was kept well ahead of the Ribes eradication crews and was made on all areas worked in 1934 except the plantations at Still Creek and Mt. Hebo. In the writer's opinion, a survey of this kind is necessary in the pine stands of southern Oregon because of the irregularities in the occurrence of pine and the somewhat uncertain value of some of the pine stands.

Experimental Eradication of Ribes cereum

A special eradication problem arose on the upper Rogue River drainage due to the prevalence of heavy concentrations of R. cereum. Hand grubbing methods proved ineffective because of the large size of this Ribes species. Accordingly an effort was made to develop a less expensive eradication method. A special eradication digging tool designed for use with a team of horses, was developed (see drawing). With this tool, a team of horses, a teamster, and two men, 507 bushes or clumps of bushes were pulled in 9 hours on an area of 6.5 acres. One man drove the team, one operated the tool and one moved the eradicated clumps and pulled missed roots. All large bushes were pulled in

The methods used in Ribes eradication in Oregon are very similar to band-pulling methods developed and used in Idaho and California. Detailed descriptions of these methods have been given in previous reports and manuals. In general, these established lines of procedure were followed, and only special problems encountered in the Oregon operations will be discussed.

Initial Preparation Survey

Late in the season of 1933, a preliminary survey of the white pine area of the season, only an extensive examination could be undertaken. Approximate locations of white and sugar pine stands considered of sufficient value to warrant protection from blister rust were determined and a general knowledge of Ribes conditions upon these areas obtained. In order to secure accurate records on the location of white and sugar pine, particularly the reproduction, and to obtain a working knowledge of the area necessary in connection with the Ribes eradication program of 1934, five trained men were put into the field early in the 1934 season. The general areas located in 1933 were systematically stripped every 10 chains. The number of feet of live stem of all Ribes on the strips was recorded. In addition to the Ribes data, all 7 to 12 inches, and over 12 inches. A timber type map was made of the control unit, on which was shown in color the location of (1) all white and sugar pine type, (2) types in which white and sugar pine occur but insufficient in amount to constitute a type, and (3) non-white pine types.

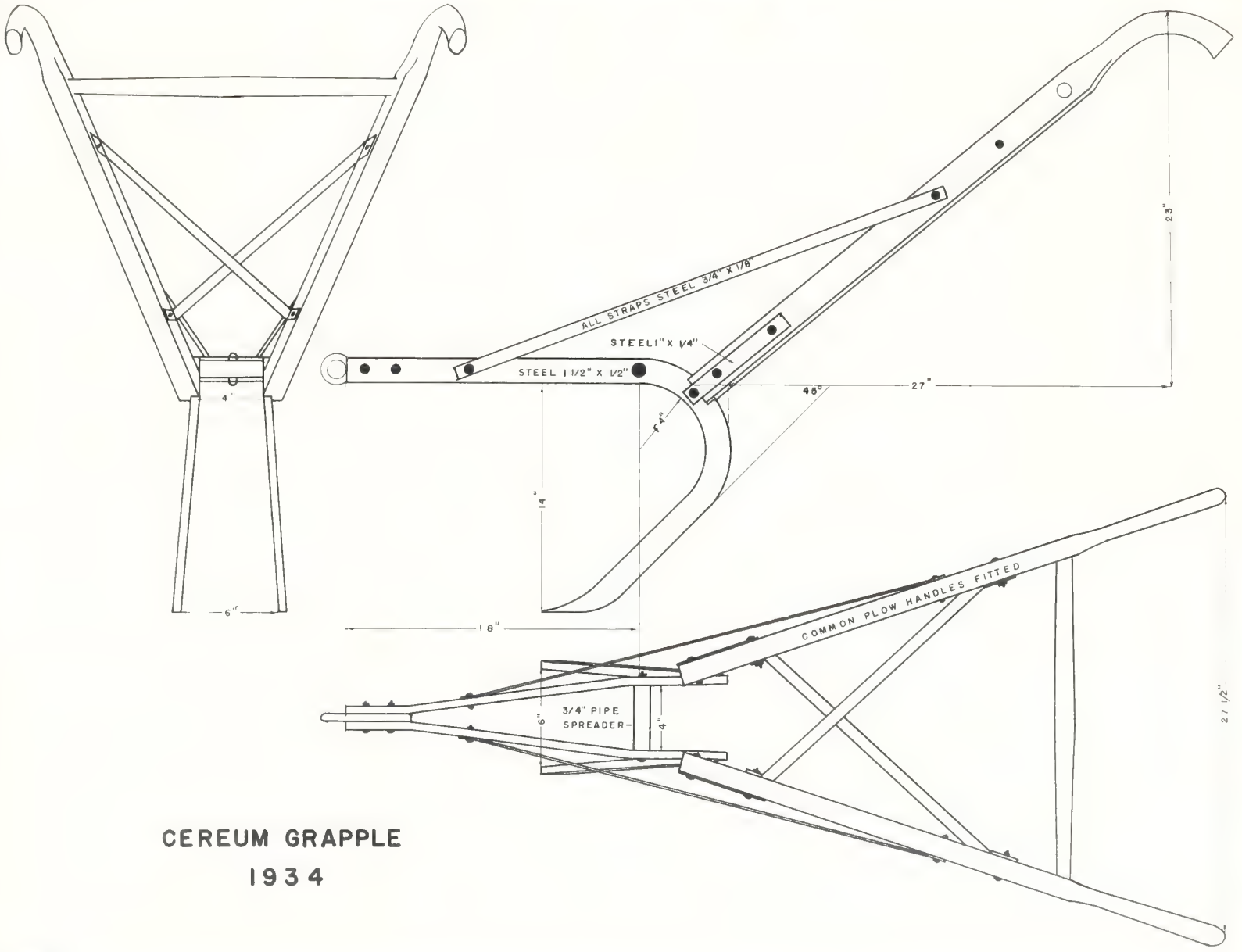
All Ribes and pine data were plotted on maps to serve as the basis for planning the eradication operation and delimiting work areas. Areas which

This survey was kept well ahead of the Ribes eradication crews and of pine and the somewhat uncertain value of some of the pine stands.

Experimental Eradication of Ribes cereum

A special eradication problem arose on the upper Sogne River drainage

methods proved ineffective because of the large size of this Ribes species. Accordingly an effort was made to develop a less expensive eradication method. A special eradication digging tool designed for use with a team of horses, was developed (see drawing). With this tool, a team of horses, a teamster, and two men, 507 bushes or clumps of bushes were pulled in 9 hours on an area of 8.5 acres. One man drove the team, one operated the tool and one moved the eradicated clumps and pulled missed roots. All large bushes were pulled in



CEREUM GRAPPLE

1934

ANNUAL REPORT 1934
C.P. WESSELA

this manner leaving all small ones to be eradicated by regular hand-pulling methods. Approximately two man days will be required to complete the hand eradication on the area. Figuring the cost of a team at $3.00 per 8-hour day, and the cost of an effective man day at $7.607, the cost of giving the area a complete initial working amounts to $43.89 or $6.74 per acre. The cost per large bush is $0.08½ as compared to an average cost of $0.30 by straight hand-pulling methods.

This method is workable on areas where topography is not excessively steep, brush of not over .5 density and where the soil is not excessively rocky. With more experimentation, it is believed that one man can be eliminated, and that the whole operation might be materially accelerated. However, a chemical method involving the decapitation of the bush and the application of Diesel oil to the exposed crown and lacerated stems, carried on by the chemical investigative unit, appears less expensive, more mobile, and more practical than the method just described.

LOCATION AND DESCRIPTION OF AREAS

The exact locations of areas worked on the Rogue River, Mt. Hood and Siuslaw operations are shown in maps accompanying this report. A brief description of each of these units follows:

A. Rogue River Unit.

For convenience in describing this unit it will be divided into three separate areas, namely: (1) the Prospect area, (2) the Woodruff Meadows area, and (3) the Foster Creek area.

1. The Prospect area, comprising 18,448 acres of sugar pine type, is the largest continuous area worked on the Rogue River unit. This whole area is practically level except for the deep, narrow gorges cut by the Rogue River and its tributaries. Virtually the entire area supports an all-aged stand of timber with a light understory of brush on upland and heavy concentrations of brush on the stream type.

Approximately two-thirds of the area was Ribes-free, while the streams supported heavy concentrations of R. klamathense and R. lacustre intermixed with dense brush. The precipitous walls of the Rogue River gorge presented a dangerous and expensive work problem, as the crews were forced to work suspended over the canyon sides on ropes a considerable portion of the time.

2. Ribes eradication was started on the Woodruff Meadows area in 1933 and continued in 1933 and 1934. The portion worked during 1934 supports white pine near the streams and sugar pine along the ridges. Brush and reproduction of about five-tenths density form the understory. The topography is steep and broken and work was slow and expensive due to a dense growth of R. lacustre on the streams and concentrations of R. binominatum on the upland.

this manner leaving all small ones to be classified by regular hand-pulling methods. Approximately two man days will be required to complete the hand eradication on the area. Figuring the cost of a team at $6.00 per 8-hour day, and the cost of an effective man day at $1.50¢, the cost of giving the area a complete initial working amounts to $42.85 or $2.75 per acre. The cost per large bush is $0.08½ as compared to an average cost of $0.80 by straight hand-pulling methods.

This method is workable on areas where topography is not excessively steep, brush of not over .5 density and where the soil is not excessively rocky. With more experimentation, it is believed that one man can be eliminated, and that the whole operation might be materially accelerated. However, a chemical method involving the decapitation of the bush and the application of Diesel oil to the exposed crown and lacerated stems, carried on by the chemical investigative unit, appears less expensive, more mobile, and more practical than the method just described.

LOCATION AND DESCRIPTION OF AREAS

The exact locations of areas worked on the Rogue River, Mt. Hood and Siuslaw operations are shown in maps accompanying this report. A brief description of each of these units follows:

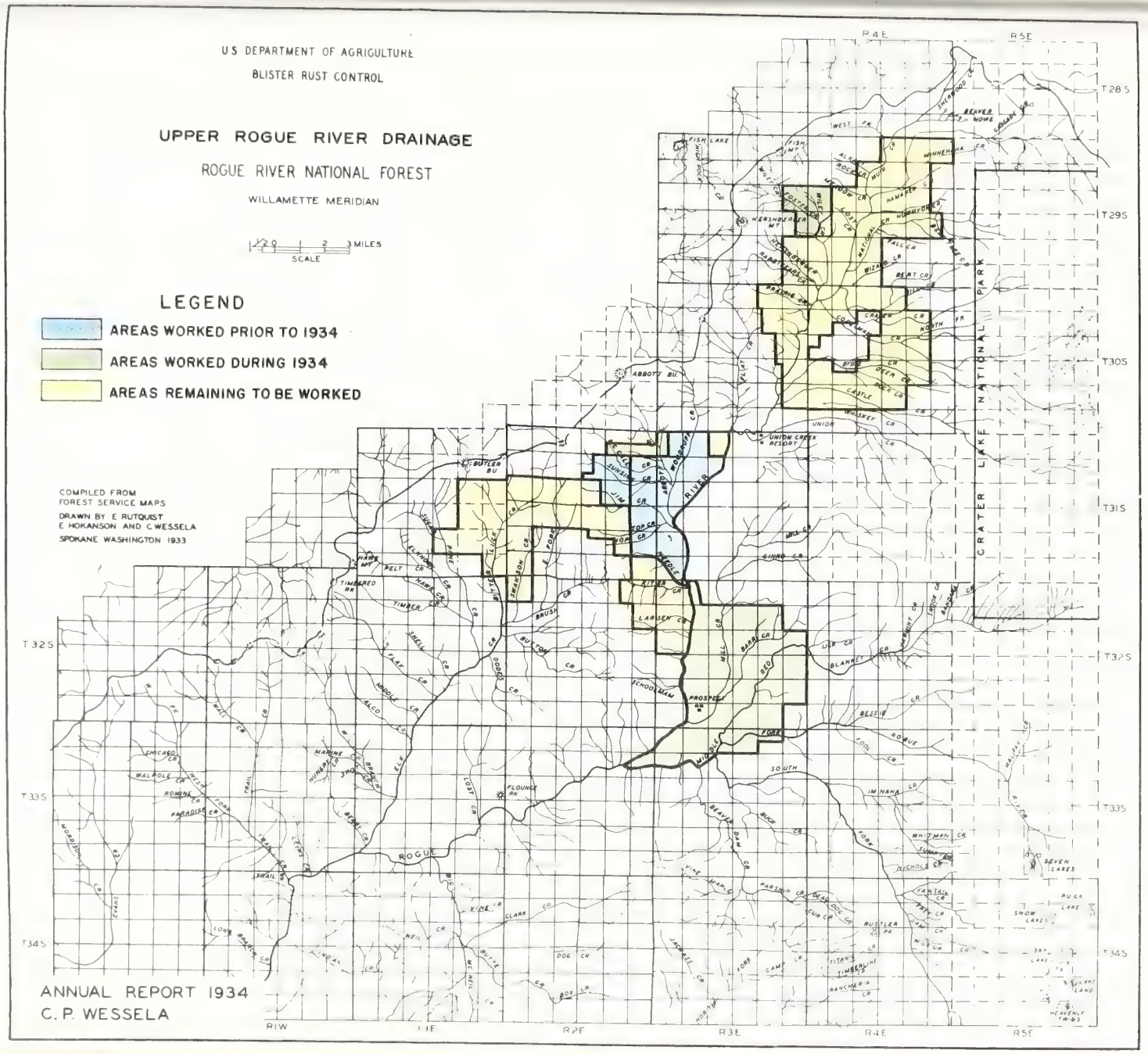
Rogue River Unit

For convenience in describing this unit it will be divided into three separate areas, namely: (1) the Prospect area, (2) the Woodruff Meadows area, and (3) the Foster Creek area.

1. The Prospect area, comprising 18,640 acres of auger pine type, is the largest continuous area worked on the Rogue River unit. This whole area is practically level except for the deep, narrow gorges cut by the Rogue River and its tributaries. Virtually the entire area supports an all-aged stand of timber with a light understory of brush on upland and heavy concentrations of brush on the stream type.

Approximately two-thirds of the area was Sitka-type, while the stream supported heavy concentrations of R. Nivalis-ursa and R. Leucotre intermixed with dense brush. The precipitous walls of the Rogue River gorge presented a dangerous and expensive work problem, as the crews were forced to work suspended over the canyon sides on ropes a considerable portion of the time.

2. Ribes eradication was started on the Woodruff Meadows area in 1938 and continued in 1939 and 1940. The pyrite [illegible] to a dense growth of R. Leucotre on the streams and concentrations of R. Divaricatum on the upland.


U.S. DEPARTMENT OF AGRICULTURE
BLISTER RUST CONTROL
UPPER ROGUE RIVER DRAINAGE
ROGUE RIVER NATIONAL FOREST
WILLAMETTE MERIDIAN
SCALE
MILES
LEGEND
AREAS WORKED PRIOR TO 1934
AREAS WORKED DURING 1934
AREAS REMAINING TO BE WORKED
COMPILED FROM FOREST SERVICE MAPS
DRAWN BY E. RUTQUIST
E. HOKANSON AND C. WESSELA
SPOKANE WASHINGTON 1933
CRATER LAKE NATIONAL PARK
ROGUE
ANNUAL REPORT 1934
C. P. WESSELA

3. The Foster Creek area lies well within the white pine belt of the Rogue River drainage. Streams, springs, upland swamps, and moist depressions are plentiful and support a very heavy Ribes growth. The topography is generally steep and stream bottoms are wide.

The heavy concentrations of R. binominatum on the upland make this the most expensive and difficult area on the Rogue River unit to work. A total of 1,875 acres was covered, averaging 538 Ribes per acre, of which 359 were R. binominatum. Six different species comprise the remainder.

B. Mt. Hood Unit (Still Creek area).

The Still Creek plantings at the present time cover approximately 560 acres on an area burned over in 1910. The plantation was started in 1913 and enlarged in 1918 and 1919. Blister rust infection first appeared on the planted pines in 1927. The spread of infection has not been rapid, probably because of complete initial eradication of Ribes in 1931. The stands of planted pine are in a thrifty condition and are supplemented to some extent by natural white pine reproduction.

The entire area was given a careful reworking this year in an effort to stamp out the Ribes population as thoroughly as possible. Working conditions were not especially difficult except in pulling the concentrations of R. bracteosum which survived the chemical treatment of 1931.

C. Siuslaw Unit (Mt. Hebo Plantation).

The Mt. Hebo plantation of eastern white pine covers a continuous area of 140 acres on an area burned over in 1910. The plantation was started in 1913. Young pines growing near streams which supported a growth of R. bracteosum are heavily infected with blister rust.

R. bracteosum was the only Ribes species found on this area and it was confined entirely to the stream type. The eradication of R. bracteosum was extremely slow and expensive because of the density and size of the bushes. All stream type in the immediate vicinity of the plantation was worked. However, there still remain 30 acres supporting a dense growth of R. bracteosum a short distance away which should be treated to insure greater protection to the plantation. (See map of planting.)

CHECKING

Methods of checking used in Oregon in 1934 were the same as those used in Idaho. The same standards of efficiency were used except on areas from which R. binominatum was eradicated for the first time. This species sprouts so readily it was thought to be a waste of time to check the area for efficiency this year as such a check would be meaningless.

3. The Foster Creek area lies well within the Rogue River drainage. Streams, springs, wooded swamps, and moist depressions are plentiful and support a very heavy Abies growth. The topography is generally steep and stream bottoms are wide.

The heavy concentrations of R. binominatum on the upland soils are the most expensive and difficult area on the Rogue River unit to work. A total of 1,875 acres was covered, averaging 325 trees per acre, of which 359 were R. binominatum. Six different species comprise the remainder.

4. [illegible] area

The Still Creek plantings at the present time cover approximately 382 acres on an area burned over in 1913. The plantation was started in 1918 and enlarged in 1919 and 1919. Silver rust infection first appeared on the planted pines in 1927. The spread of infection has not been rapid, probably because of complete initial eradication of Ribes in 1931. The stands of planted pine are in a thrifty condition and are supplemented to some extent by natural white pine reproduction.

The entire area was given a careful reworking this year in an effort to [illegible] as thoroughly as possible. [illegible] were not especially efficient except in pulling [illegible] R. bracteosum which survived the chemical treatment of 1931.

5. Status Unit (Mt. Hebo Plantation).

The Mt. Hebo plantation of eastern white pine covers a contiguous area of 140 acres on an area burned over in 1910. The plantation was started in 1913. Young pines growing near streams which supported a growth of R. bracteosum are heavily infected with blister rust.

R. bracteosum was the only Ribes species found on this area and it was confined entirely to the stream type. The eradication of R. bracteosum was extremely slow and expensive because of the nearly wet nature of the bunches. All stream type in the immediate vicinity of the plantation was worked. However, there still remain 30 acres supporting a dense growth of R. bracteosum a short distance away which should be treated to insure greater protection to the plantation. (See map of planting.)

[illegible]

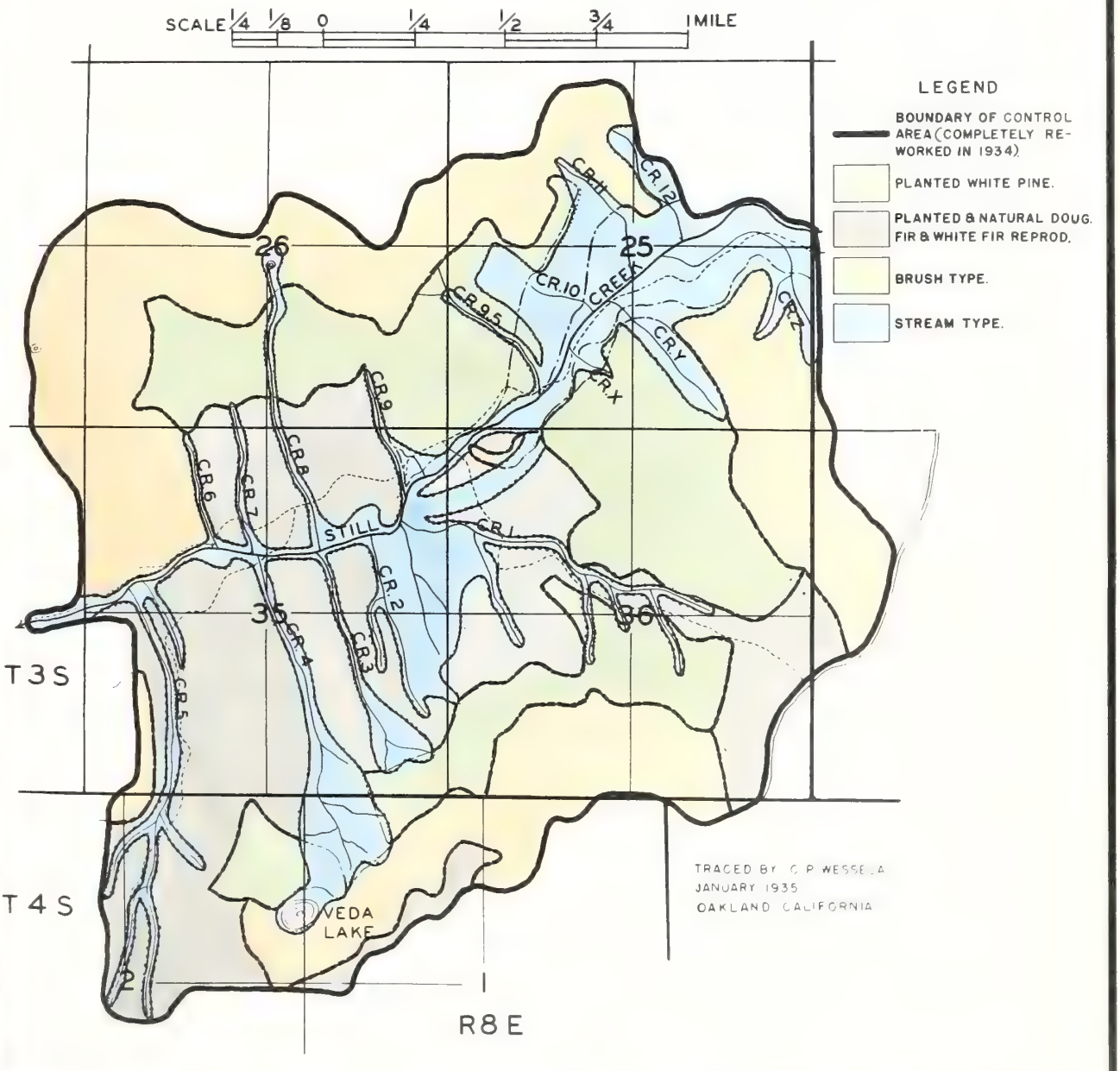
Methods of checking used in Oregon in 1934 were the same as those used in Idaho. The same standards of efficiency were used except on stream from which R. binominatum was eradicated for the first time. This species appears as readily it was thought to be a waste of time to check the area for efficiency this year as such a check would be unnecessary.

U S DEPARTMENT OF AGRICULTURE
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
BLISTER RUST CONTROL

STILL CREEK WHITE PINE PLANTATION

MT. HOOD NATIONAL FOREST

WILLAMETTE MERIDIAN



ANNUAL REPORT 1934
C. P. WESSELA

U S DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

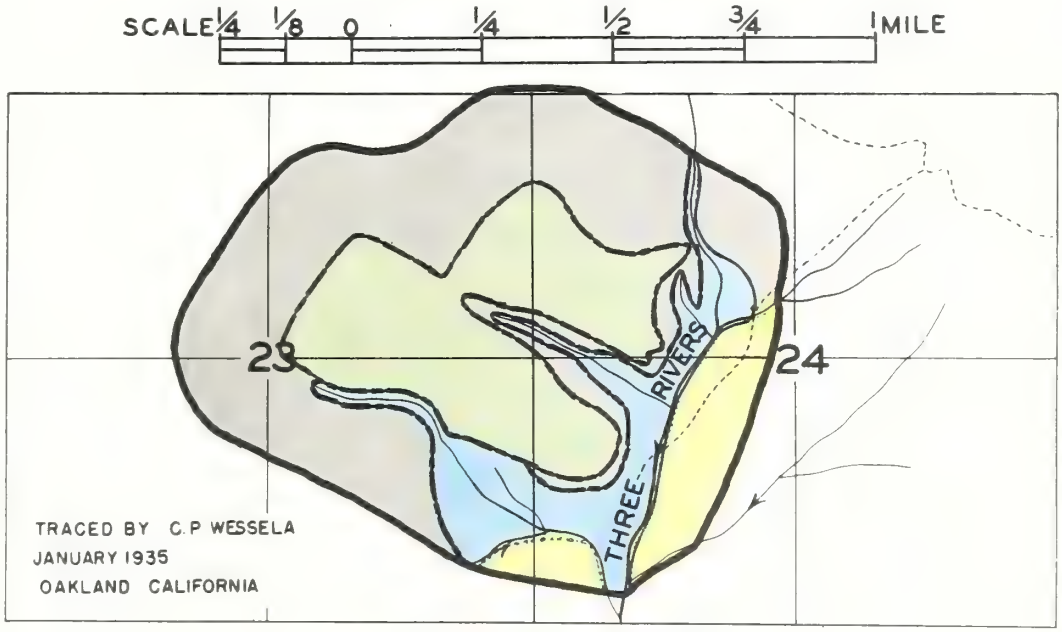
BLISTER RUST CONTROL

MT. HEBO WHITE PINE PLANTATION

SIUSLAW NATIONAL FOREST

WILLAMETTE MERIDIAN

TOWNSHIP 4 SOUTH — RANGE 9 WEST



LEGEND

- BOUNDARY OF CONTROL AREA.
- PLANTED EASTERN WHITE PINE.
- PLANTED & NATURAL DOUG. FIR REPRODUCTION.
- STREAM TYPE.
- AREAS REMAINING TO BE WORKED.

ANNUAL REPORT 1934
C.P. WESSELA.

Checking was under the general supervision of the unit supervisor. One foreman and four checkers were responsible for the field work and the keeping of records.

The following table gives the cost of checking operations in Oregon during 1934:

COST OF CHECKING

Salaries	$3,072.23
Subsistence	660.69
Transportation	150.00
Total	$3,882.92

Total number effective checker man days - 499
Cost per effective man day - $7.77

A total of 23,227 acres treated initially in 1934 and 7,647 acres worked in 1925 and 1933 were checked during 1934. In addition to this acreage, 3,801 acres which were not worked by the Ribes eradication crews were covered by the advance check and pine count survey. Therefore, a total of 34,875 acres was covered by the checking organization.

The per acre cost of checking amounted to $0.11.

An analysis of the results of checking appears in table No. 8 of this report.

COST OF 1934 OPERATION

The following tables Nos. 1, 2 and 3 give an analysis of the costs of the 1934 Ribes eradication operation in Oregon:

TABLE NO. 1

CLASSIFIED EXPENDITURES, OREGON
1934

Item	Rogue River	Mt. Hood	*Siuslaw	Totals
Salaries, permanent men	$1,983.22	$712.75	$292.76	$2,988.73
Wages, temporary men	37,083.58	5,797.78	1,565.60	44,446.86
Subsistence supplies	5,098.31	1,128.16	272.85	6,499.32
Services and other supplies	726.36	133.09	5.75	865.20
Equipment	1,081.80	853.81	20.00	1,955.61
Transportation and travel	1,669.45	175.99	30.23	1,875.67
Total expenditures	$47,642.52	$8,801.58	$2,190.09	$59,634.19

*All expenditures on this operation paid by the Forest Service except cost of supervision, $367.82; permanent salaries, $292.76, and travel expenses, $20.00.

Checking was under the general supervision of [illegible]. One foreman and four checkers were responsible for the field work and the keeping of records.

The following table gives the cost of checking operations in Oregon during 1954:

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Total	$6,[illegible].94

Total number effective checker man days - 495
Cost per effective man day - $7.77

A total of 25,287 acres treated initially in 1954 and 7,941 acres worked in 1953 and 1952 were checked during 1954. In addition to this acreage, 3,801 acres which were not worked by the Ribes eradication crews were covered by the advance check and pine count survey. Therefore, a total of 34,875 acres was covered by the checking organization.

The per acre cost of checking amounted to $0.11.

An analysis of the results of checking appears in table No. 3 of this report.

COST OF RIBES OPERATION

The following tables Nos. 1, 2 and 3 give an analysis on the costs of the 1954 Ribes eradication operation in Oregon:

TABLE NO. 1

[illegible]
1954

Item	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Services and other supplies	[illegible]	[illegible]	[illegible]
Equipment	[illegible]	[illegible]	[illegible]
Transportation and travel	[illegible]	[illegible]	[illegible]
Total expenditures	[illegible]	[illegible]	[illegible]

*All expenditures of this county, [illegible] cost of supervision, $[illegible]; permanent salaries, $[illegible], and travel expenses, $[illegible].

TABLE NO. 2

COST OF NIRA OPERATION, OREGON, 1934

	Item	Rogue River	Mt. Hood	Siuslaw	Totals
	Total 1934 expenditures	$47,642.52	$8,801.58	$2,190.09	$58,634.19
Credit	2/3 cost of 1934 equipment	721.07	569.21	13.32	1,303.60
Credit	Supplies on hand	180.00	-	-	180.00
Credit	Expenditures not chargeable to field operation	292.77	292.76	292.76	878.29
Credit	Totals	$1,193.84	$861.97	$306.08	$2,361.89
Debit	1/3 cost of 1933 equipment	756.72	-	-	756.72
	Net cost of 1934 operation	$47,205.40	$7,939.61	$1,884.01	$57,029.02
	Cost of effective man day	$7.607	$5.726	$9.576	$7.322

TABLE NO. 3

MEAL COSTS, OREGON, 1934

Item	Rogue River	Mt. Hood	Siuslaw	Total
Food	$4,918.31	$1,128.16	$272.85	$6,319.32
Kitchen help	4,079.00	1,048.60	164.10	5,291.70
Transportation	1,036.50	196.30	-	1,232.80
Totals	$10,033.81	$2,373.06	$436.95	$12,843.82
Amount paid by men	7,515.60	1,687.80	201.30	9,404.70
Deficit	$2,518.21	$685.26	$235.65	$3,439.12
Total meals served	26,221	5,754	671	32,646
Average cost per meal	$.382	$.412	$.651	$.393
Average deficit per meal	$.082	$.112	$.351	$.093

RESULTS OF WORK

Tables No. 4 to No. 8 show results of Ribes eradication work during 1934.

TABLE NO. 8

COST OF MESS OPERATION, CAMPUS, 1934

Item	Regular Diet	Special Diet	Private Table	Staff
Total 1934 annual outgo	[illegible]	[illegible]	[illegible]	[illegible]
1/3 cost of 1933 equipment	[illegible]	[illegible]	[illegible]	[illegible]
Supplies on hand	[illegible]			
Expenditures not chargeable to field operation	[illegible]	[illegible]	[illegible]	[illegible]
Totals	[illegible]	[illegible]	[illegible]	[illegible]
1/3 cost of 1933 equipment	[illegible]			
Net cost of 1934 operation	[illegible]	[illegible]	[illegible]	[illegible]
Cost of effective meal tax	[illegible]	[illegible]	[illegible]	[illegible]

TABLE NO. 9

MESS COSTS, CAMPUS, 1934

Item	Regular Diet	Special Diet	Private Table	Staff
Food	[illegible]	[illegible]	[illegible]	[illegible]
Kitchen Help	[illegible]	[illegible]	[illegible]	[illegible]
Transportation	[illegible]	[illegible]		[illegible]
Totals	[illegible]	[illegible]	[illegible]	[illegible]
Amount paid by men	[illegible]	[illegible]	[illegible]	[illegible]
Deficit	[illegible]	[illegible]	[illegible]	[illegible]
Total meals served	[illegible]	[illegible]	[illegible]	33,666
Average cost per meal	[illegible]	[illegible]	[illegible]	[illegible]
Average deficit per meal	[illegible]	[illegible]	[illegible]	[illegible]

TABLE OF [illegible]

Table No. 4 to No. 1 show results of Mines operations over [illegible] 1934.

TABLE NO. 4

SUMMARY OF RIBES ERADICATION BY CONTROL UNITS, OREGON
1934

Class of Work	Control Unit	Acres Covered			Man Days			Total Ribes Eradicated	Total Cost	For Acre	
		Worked by Crews	Blocked Out*	Total	Effective Man Days**	Non-effective Man Days ***	Total			Ribes	Cost
	Rogue River N. F.	7,398.6	14,702.5	22,101.1	6,206	1,731	7,937	2,141,869	$47,205.40	96.9	$2.14
MIRA	Mt. Hood N.F.-Still Creek Plantation	1,061.0	1,460.0	2,521.0	1,386	422	1,808	368,844	7,939.61	146.3	3.15
	Siuslaw N.F.-Mt. Hebo Plantation	85.0	395.0	480.0	197	123	320	68,336	1,884.01	142.4	3.92
	Totals	8,544.6	16,557.5	25,10 .1	7,789	2,276	10,065	2,579,049	$57,029.02	102.7	$2.27

*Blocked-out areas are areas originally supporting less than 25 feet of live stem per acre, and therefore requiring no crew work.

**Includes both crew work and time expended in blocking out areas.

***Includes all non-effective man days connected with the eradication project not included under effective man days. Non-effective man days includes the time of camp foremen, checkers, field clerk, cooks, flunkies, and any other labor not actually engaged in pulling Ribes.

TABLE NO. 5

SUMMARY OF RIBES ERADICATION BY TYPES - OREGON, 1934

Control Unit	Eradication Types	Acres Covered	Effective Man Days	Ribes Eradicated	Costs	Per Acre Basis		
						Man Days	Ribes	Costs
Rogue River N. F.	Timber	18,487.9	3,382	1,012,134	$25,725.49	.183	54.7	$1.39
	Cut over	703.7	55	7,471	419.34	.078	10.6	.60
	Brush	60.2	11	1,092	83.67	.183	18.1	1.39
	Stream	2,849.3	2,758	1,121,172	20,976.90	.967	393.5	7.36
	Total	22,101.1	6,206	2,141,869	47,205.40	.281	96.9	2.14
Mt. Hood N. F. Still Creek Plantation	Planted area	1,016.0	16	None	91.61	.016	None	.09
	Brush	838.0	287	53,855	1,645.47	.343	64.3	1.96
	Stream	667.0	1,083	314,989	6,202.53	1.620	472.2	9.30
	Total	2,521.0	1,386	368,844	7,939.61	.550	146.3	3.15
Siuslaw N. F. Mt. Hebo Plantation	Planted area	395.0	3	None	23.94	.006	None	.06
	Stream	85.0	194	68,336	1,860.07	2.285	804.0	21.88
	Total	480.0	197	68,336	1,884.01	.410	142.4	3.92
Grand Totals	Timber	18,487.9	3,382	1,012,134	24,761.16	.183	54.7	1.34
	Planted area	1,411.0	19	None	135.46	.013	None	.09
	Cut over	703.7	55	7,471	403.63	.078	10.6	.57
	Brush	898.2	298	54,947	2,184.65	.332	61.2	2.43
	Stream	3,601.3	4,035	1,504,497	29,544.12	1.120	417.8	8.20
	Total	25,102.1	7,789	2,579,049	$57,029.02	.310	102.7	2.27

Table 6.2

SUMMARY OF STATE POPULATION BY STATE - CENSUS, 1850

State	Population	Area	Density	Rank	Growth
Alabama	771,623	50,722	15.2	22	92.3%
Arkansas	209,897	52,198	4.0	30	311.5%
California	92,597	155,980	0.6	31	1,750.0%
Connecticut	370,792	4,845	76.5	15	23.4%
Delaware	91,532	1,960	46.7	27	12.1%
Florida	87,445	58,560	1.5	29	158.3%
Georgia	906,185	58,977	15.4	21	51.2%
Illinois	851,470	56,400	15.1	23	1,276.9%
Indiana	988,416	36,291	27.2	19	348.2%
Iowa	192,214	56,147	3.4	28	1,825.0%
Kentucky	982,405	40,395	24.3	17	19.8%
Louisiana	517,762	48,506	10.7	24	108.4%
Maine	583,169	33,040	17.7	20	11.5%
Maryland	687,049	12,297	55.9	16	19.4%
Massachusetts	994,514	8,257	120.5	13	19.8%
Michigan	397,654	58,915	6.8	26	1,206.3%
Mississippi	606,526	47,156	12.9	25	70.4%
Missouri	682,044	68,995	9.9	18	1,205.0%
New Hampshire	317,976	9,304	34.2	14	12.7%
New Jersey	489,555	7,836	62.5	12	23.1%
New York	3,097,394	49,576	62.5	1	33.5%
North Carolina	869,039	52,669	16.5	9	15.4%
Ohio	1,980,329	41,040	48.3	2	61.7%
Pennsylvania	2,311,786	46,000	50.3	3	34.5%
Rhode Island	147,545	1,214	121.5	10	23.1%
South Carolina	668,507	32,007	20.9	8	4.2%
Tennessee	1,002,717	42,244	23.7	7	30.2%
Texas	212,592	267,339	0.8	32	2,519.0%
Vermont	314,120	9,609	32.7	11	11.2%
Virginia	1,421,661	42,769	33.2	4	15.4%
Wisconsin	305,391	54,464	5.6	27	1,525.0%
Total	**23,191,876**	**1,903,001**	**12.2**		**35.9%**

TABLE NO. 6

SUMMARY OF RIBES ERADICATION BY OWNERSHIP, OREGON
1934

Control Unit	Ownership	Total Area Covered		Effective Man Days	Total Ribes Eradicated	Cost of Operation
		Acres	Percent Ownership			
Rogue River N. F.	Federal	3,653.0	16.5	3,335	1,523,031	$25,368.92
	Private	18,448.1	83.5	2,871	618,838	21,836.48
	Total	22,101.1	100.0	6,206	2,141,869	47,205.40
Mt. Hood N. F.	Federal	2,521.0	100.0	1,386	368,844	7,939.61
	Private	None	-	-	-	-
	Total	2,521.0	100.0	1,386	368,844	7,939.61
Siuslaw N. F.	Federal	480.0	100.0	197	68,336	1,884.01
	Private	None	-	-	-	-
	Total	480.0	100.0	197	68,336	1,884.01
Grand Totals	Federal	6,654.0	26.5	4,918	1,960,211	35,192.54
	Private	18,448.1	73.5	2,871	618,838	21,836.48
	Total	25,102.1	100.0	7,789	2,579,049	$57,029.02

Table No. 2

SUMMARY OF BLOOD CONDITION AT CHARLESTON, CHECO
1954

Control Unit	Component	Total Forces Reported		Total Forces Reported	
		Active	Percent Deficient	Men Days	Time Lost
3d Force Strength	Regular	3,851.0	16.8	4,000	1,525,031
	Private	14,648.1	82.4	3,871	618,801
	Total	18,499.1	100.0	5,206	2,143,859
Mt. Hood	Regular	8,891.0	100.0	1,386	558,844
	Private	None	-	-	-
	Total	8,891.0	100.0	1,386	558,844
Strains	Regular	4,852.0	100.0	197	6,355
	Private	None	-	-	-
	Total	4,852.0	100.0	197	6,355
Grand Totals	Regular	8,743.0	32.5	5,583	2,089,231
	Private	14,648.1	73.5	3,871	618,801
	Total	23,391.1	100.0	7,788	2,708,032

TABLE NO. 7a

TOTAL RIBES ERADICATED BY SPECIES AND TYPE, OREGON, 1934

Ribes Species and Percent of Total of Each Species	Control Units									
	Rogue River N. F.					Mt. Hood N. F. *Still Creek Plantation			*Siuslaw N.F.- Hebo Plantation	
	Timber	Cut over	Brush	Stream	Total	Brush	Stream	Total	Stream	Total
R. lacustre	88,525	90	171	584,111	672,897	45,936	185,691	231,627	-	-
Percent of tot.	8.74	1.20	15.65	52.09	31.41	85.29	58.95	62.79	-	-
R. sanguineum	133,394	5,430	299	78,491	217,614	4,368	390	4,758	-	-
Percent of tot.	13.15	72.68	27.38	7.0	10.16	8.11	.12	1.28	-	-
R. lobbii	11,653	926	-	5,936	18,515	-	-	-	-	-
Percent of tot.	1.15	12.39	-	.52	.87	-	-	-	-	-
R. klamathense	6,080	609	-	231,536	238,225	-	-	-	-	-
Percent of tot.	.63	8.15	-	20.65	11.12	-	-	-	-	-
R. cruentum	93,216	229	622	10,108	104,175	-	-	-	-	-
Percent of tot.	9.26	3.06	56.95	.90	4.86	-	-	-	-	-
R. cereum	785	187	-	55	1,027	-	-	-	-	-
Percent of tot.	.07	2.50	-	.004	.04	-	-	-	-	-
R. bracteosum	-	-	-	16,271	16,271	1,659	124,394	126,053	68,336	68,336
Percent of tot.	-	-	-	1.45	.76	3.08	39.49	34.17	100	100
R. binominatum	620,133	-	-	194,267	814,400	-	-	-	-	-
Percent of tot.	61.21	-	-	17.32	38.02	-	-	-	-	-
R. viscosissimum	58,348	-	-	397	58,745	1,892	-	1,892	-	-
Percent of tot.	5.75	-	-	.03	2.74	3.51	-	.51	-	-
R. triste	-	-	-	-	-	-	4,514	4,514	-	-
Percent of tot.	-	-	-	-	-	-	1.43	1.23	-	-
Total Ribes	1,012,134	7,471	1,092	1,121,172	2,141,869	53,855	314,989	368,844	68,336	68,336

*No Ribes occurred within the planted area itself.

Table 28, 29

POST BURN VEGETATION OF CEDROS, SAN ONOFRE, 1974

| Species | Total # of Species and Percent of Each | Control Plots | | |

TABLE NO. 7b

TOTAL RIBES ERADICATED BY SPECIES AND TYPE, OREGON
1934

Ribes Species and Percent of Total of Each Species	Totals all Units				
	Timber	Cut Over	Brush	Stream	Totals
R. lacustre	88,525	90	46,107	769,802	904,524
Percent of total	8.74	1.20	83.92	51.18	35.07
R. sanguineum	133,394	5,430	4,667	78,881	222,372
Percent of total	13.15	72.68	8.49	5.24	8.63
R. lobbii	11,653	926	-	5,936	18,515
Percent of total	1.15	12.39	-	.40	.72
R. klamathense	6,080	609	-	231,536	238,225
Percent of total	.63	8.15	-	15.38	9.24
R. cruentum	93,216	229	622	10,108	104,175
Percent of total	9.26	3.06	1.13	.67	4.03
R. cereum	785	187	-	55	1,027
Percent of total	.07	2.50	-	.003	.03
R. bracteosum	-	-	1,659	209,001	210,660
Percent of total	-	-	3.01	13.89	8.18
R. binominatum	620,133	-	-	194,267	814,400
Percent of total	61.21	-	-	12.91	31.57
R. viscosissimum	58,348	-	1,892	397	60,637
Percent of total	5.75	-	3.45	.02	2.36
R. triste	-	-	-	4,514	4,514
Percent of total	-	-	-	.30	.17
Total Ribes	1,012,134	7,471	54,947	1,504,497	2,579,049

TABLE NO. 76

TOTAL RIVER DISCHARGE BY SPECIES AND TYPE, DECEMBER 1954

Kilns Species and Percent of Total at Each Station	Total at Unit			
	Tumbler	Rotary	Grate	Shaft
1. Limestone	58,256	90	46,107	768,003
Percent of total	5.74	1.20	81.18	85.07
2. Dolomite	156,394	5,650	4,957	78,801
Percent of total	15.45	6.49	8.74	8.72
3. Dolomitic limestone	11,552	556	-	12,315
Percent of total	1.15	14.50	-	1.36
4. Calcium oxide	6,050	409	-	821,055
Percent of total	.61	8.16	-	16.38
5. Other types	91,914	2429	5,232	10,106
Percent of total	9.04	5.84	1.18	.67
6. Gypsum	784	184	-	89
Percent of total	.07	2.50	-	.09
7. Brucite	-	-	1,459	204,001
Percent of total	-	-	2.04	18.89
8. Hydrated lime	542,120	-	-	196,257
Percent of total	53.21	-	-	19.91
9. Pressed pellets	66,548	-	1,252	397
Percent of total	5.76	-	6.45	.05
10. Brucite	-	-	-	4,214
Percent of total	-	-	-	.41
Total Tons	1,018,148	7,417	64,047	1,004,197

TABLE NO. 8

SUMMARY OF FINAL CHECKING RESULTS,
OREGON, 1934

Control Unit		Ribes Eradication Types	Acres Worked By Crews	Acres Checked	Per-cent of Check	Man Days on Check	Per Acre Results		Acres Blocked Out by Adv.Check			
							Missed Bushes	Missed F.L.S.	Acres Blocked Out	Man Days	Per Acre Results Bushes	Per Acre Results F.L.S.
Rogue River N. F.		Timber	2,937.4	107.6	3.66	57	1.9	13.6	14,022.5	140-6/8	.2	1.4
	1	Cut over	88.7	8.2	9.24	5	1.3	14.9	615.0	6-4/8	.1	3.9
	9	Brush	20.2	.8	3.96	4/8	9.0	51.3	40.0	4/8	-	-
	3	Stream	2,477.3	105.6	4.26	57	.7	8.6	25.0	2/8	-	-
	4	Total	5,523.6	222.2	4.02	119-1/2	2.2	11.4	14,702.5	148	.2	1.5
	1	Timber	7,192.0	215.28	3.0	80	1.4	17.6	-	-	-	-
	9	Stream	655.0	20.78	3.17	11	3.4	28.4	-	-	-	-
	3											
	3	Total	7,847.0	236.06	3.0	91	1.6	18.6	-	-	-	-
Mt. Hood N. F. - Still Creek Plantation		Planted area	-	-	-	-	-	-	1,016.0	16	.5	1.8
		Brush	394.0	13.69	3.47	5	.7	3.7	444.0	7	.1	1.4
		Stream	667.0	33.3	4.99	1e-1/2	3.7	9.5	-	-	-	-
		Total	1,061.0	46.99	4.42	17-1/2	2.9	7.8	1,460.0	23	.4	1.7
Siuslaw N. F.- Hebo Plantation		Planted area	-	-	-	-	-	-	395.0	2	-	-
		Stream	85.0	6.34	7.46	2	8.4	12.5	-	-	-	-
		Total	85.0	6.34	7.46	2	8.4	12.5	395.0	2	-	-
Totals or Averages			14,516.6	511.59	3.52	230	2.0	14.4	16,557.5	173	.2	1.5

| | | |

CONTROL RECONNAISSANCE

Prior to 1934, no intensive control reconnaissance work had been done in Oregon. Previous surveys had located the better stands of white and sugar pine, but very little data were obtained which were of value in formulating a comprehensive program for Ribes eradication. For this reason a control reconnaissance program was started in the upper Rogue River country and on the sugar pine stand which occurs in the Klamath River drainage near Pinehurst, Oregon. Approximately two townships in the Rogue River region and two and one-half townships on the Pinehurst area remain to be completed.

Location and Description of Areas.

The exact location of the reconnaissance work and acreage covered are shown in table No. 9.

Work in the Rogue River country was confined to the North Fork of the Rogue River drainage north of Prospect, Oregon. Topography varies from level to impassable cliffs and gorges. White and sugar pine types are somewhat irregular. This face, coupled with the variety of species of trees occurring in this region, made type mapping difficult.

Work in the Klamath region was confined to the Jenny Creek drainage north and east of Pinehurst, Oregon. The topography is rolling and not generally precipitous. No white pine occurs in this area; however, it supports an excellent stand of virgin sugar pine. Reproduction is somewhat sparse because of repeated burning of the understory. Ribes growth appears to be confined to the streams and north-facing slopes in the sugar pine-Douglas fir-white fir type.

Personnel

The personnel for the reconnaissance party was composed of one foreman and five assistants all taken from the checking organization of the Ribes eradication project.

Methods of Work

Methods used in recording data were the same as those used in California. A detailed description of these methods appears in the California control reconnaissance report.

Results of Work

The results of the 1934 survey are summarized and put in permanent record files in the same manner as described in the California report on control reconnaissance.

Personnel

The personnel for the reconnaissance party was composed of one timber cruiser and five assistants all taken from the checking organization of the Siuslaw reclassification project.

Methods of Work

Methods used in recording data were the same as those used in California. A detailed description of these methods appears in the California control reconnaissance report.

Results of Work

The results of the 1934 survey are summarized and put in permanent record files in the same manner as described in the California report on control reconnaissance.

TABLE NO. 9

SUMMARY AND LOCATION OF AREAS COVERED BY RECONNAISSANCE
ROGUE RIVER NATIONAL FOREST, OREGON
1934

Township	Range	Sections by Number	Totals	
			No. Sections	No. Acres
29 S.	3 E.	24-26, 35, 36	5	2,400
29 S.	4 E.	16, 17, 19-24, 29-33	14	8,360
30 S.	3 E.	1, 2, 11-14, 23-26, 35, 36	12	6,020
	4 E.	3-10, 14-23, 26-35	28	16,460
31 S.	2 E.	1, 2, 15, 22, 23, 26, 27, 35	8	5,387
	3 E.	6, 31	2	960
	4 E.	2-5	4	1,080
32 S.	2 E.	1, 2, 11-13	5	2,133
	3 E.	5-8, 17, 18	6	2,617
38 S.	4 E.	25-28, 33-36	8	3,070
	5 E.	29-32	4	2,260
39 S.	3 E.	25	1	250
	4 E.	1-5, 7-12, 14-36	34	19,553
	5 E.	6, 7	2	780
Totals			133	71,335

Reconnaissance Costs, 1934

1. Salaries permanent employees	$198.22
2. Salaries temporary employees	1,633.13
3. Subsistence	219.25
4. Transportation and travel	200.00
Total	$2,250.60
Cost per acre	$0.0315

TABLE NO. 9

SUMMARY AND LOCATION OF AREAS COVERED BY TOPOGRAPHIC SURVEYS
EIGHT SIXTH NATIONAL FOREST, OREGON
1944

Township	Range	Sections by Quarter	Totals	
			No. Sections	No. Acres
29 S.	6 E.	25-26, 35, 36	6	3,920
29 S.	4 E.	16, 17, 19-24, 29-32	14	8,960
	3 E.	1, 2, 11-14, 23-26, 35, 36	12	6,480
30 S.	4 E.	3-10, 15-22, 29-32	28	16,480
	2 E.	1, 2, 10, 11, 14, 23, 24, 25, 26, 35	9	5,827
	3 E.	6, 31	2	960
31 S.	4 E.	--	4	1,920
	2 E.	1, 2, 11-15	6	3,184
32 S.	3 E.	5-8, 17, 18	6	3,417
	4 E.	25-28, 33-36	8	3,920
33 S.	3 E.	29-32	4	2,480
	2 E.	25	1	360
	4 E.	1-3, 9-16, 19-36	34	17,360
34 S.	3 E.	1, 2, 7	4	730
		Totals	135	74,786

Improvements 1944

1. Salaries permanent employees	$[illegible]
2. Salaries temporary employees	1,861.12
3. Subsistence	219.45
4. Transportation and travel	200.00
Total	$3,280.60
Used per acre	$[illegible]

BLISTER RUST CONTROL WORK IN CALIFORNIA
1934

Blister rust control activities in California were continued as a cooperative project between the Bureau of Entomology and Plant Quarantine and the California Department of Agriculture, the California State Board of Forestry, and the College of Agriculture, University of California. There is given below the amendment to the basic memorandum of understanding, which was drawn up to cover the cooperative work for the fiscal year 1935, beginning July 1, 1934:

AMENDMENT TO
MEMORANDUM OF UNDERSTANDING
Effective July 1, 1931
Between
THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF ENTOMOLOGY,
THE CALIFORNIA DEPARTMENT OF AGRICULTURE, THE CALIFORNIA STATE BOARD OF FORESTRY,
AND THE COLLEGE OF AGRICULTURE, UNIVERSITY OF CALIFORNIA.

Amendment No. 3
Spokane, Wash.

Cooperative Work in Controlling White Pine Blister Rust in California.

* * *

The undersigned mutually agree that the memorandum of understanding between the United States Department of Agriculture, Bureau of Entomology, the California Department of Agriculture, the California State Board of Forestry, and the College of Agriculture, University of California, effective July 1, 1931, to continue in effect until June 30, 1932, shall be continued in full force and effect in all its provisions for the fiscal year ending June 30, 1935 with the exception of paragraphs F-1 and F-6, which shall be amended to read as follows:

F-1. That this memorandum of understanding shall take effect July 1, 1934 and continue in effect until June 30, 1935, provided that either party may terminate the agreement at any time by a written statement to that effect 30 days in advance of the date of termination desired.

F-6. That for the fiscal year July 1, 1934 to June 30, 1935 the California Department of Agriculture will contribute in value approximately $9,000.00, the California State Board of Forestry approximately $3,000.00, the College of Agriculture, University of California approximately $5,000.00, and the Federal Government in behalf of the United States Department of Agriculture, Bureau of Entomology, approximately $100,000.00 in connection with the work herein provided for.

March 23, 1934 — A. E. Burk
Director, California Department of Agriculture.

March 23, 1934 — M. B. Pratt
State Forester, California State Board of Forestry.

April 20, 1934 — C. B. Hutchison
Dean, College of Agriculture, University of California.

July 1, 1934 — Lee A. Strong
Chief, Bureau of Entomology, U. S. D. A.

Blister rust control activities in California were continued as a cooperative project between the Bureau of Entomology and Plant Quarantine and the California Department of Agriculture, the California State Board of Forestry, the College of Agriculture, University of California. There is also close cooperative work for the fiscal year 1934, beginning July 1, 1934.

AMENDMENT TO
MEMORANDUM OF UNDERSTANDING
Effective July 1, 1934
between
THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF ENTOMOLOGY,
AND PLANT QUARANTINE (Bureau of Entomology), THE CALIFORNIA STATE BOARD OF FORESTRY,
AND THE COLLEGE OF AGRICULTURE, UNIVERSITY OF CALIFORNIA.

Amendment No. 2
Spokane, Wash.

Cooperative work in controlling white pine blister rust in California

* * *

The undersigned mutually agree that the Memorandum of Understanding between the United States Department of Agriculture, Bureau of Entomology, the California Department of Agriculture, the California State Board of Forestry, and the College of Agriculture, University of California, effective July 1, 1934, be continued in effect until June 30, 1935, and shall be continued in full force and effect with all its provisions for the fiscal year ending June 30, 1936 with the exception of paragraphs 3-1 and 3-2, which shall be amended to read as follows:

3-1. This memorandum of understanding shall take effect July 1 1934 and continue in effect until June 30, 1935, provided that either party may terminate the agreement at any time by a written statement to that effect in advance of the date of termination desired.

3-2. That for the fiscal year July 1, 1934 to June 30, 1935 the California Department of Agriculture will contribute in value approximately $2,000.00, the California State Board of Forestry approximately $2,000.00, the College of Agriculture, University of California approximately $2,000.00, and the Federal government in behalf of the United States Department of Agriculture, Bureau of Entomology, approximately $100,000.00 in connection with the work before provided for.

March 23, 1934 — A. B. Burke
Director, California Department of Agriculture.

March 23, 1934 — M. B. Pratt
State Forester, California State Board of Forestry.

April 20, 1934 — C. B. Hutchison
Dean, College of Agriculture, University of California.

July 1, 1934 — Lee A. Strong
Chief, Bureau of Entomology, U. S. D. A.

RIBES ECOLOGY, CALIFORNIA, 1934

By
George A. Root
Associate Pathologist

INTRODUCTION

As in the previous year, the ecology work was confined to checking over those plots which had been established some years prior to 1934. Most of these were on the Stanislaus National Forest, but a few were on the Lassen National Forest. New work of small extent was undertaken which simply involved an extension of that which had already been established.

The writer was aided by two members of the blister rust personnel, H. R. Offord and C. R. Quick, and continued the following studies:

A. Ribes reestablishment in stream type after logging
B. Ribes reestablishment after eradication on cut over land
C. Ribes growth and germination
    1. On a non-eradicated logged off area
    2. On an eradicated virgin area
D. Ribes seed germination and seedling survival
E. Ribes seed storage in the duff and soil (1,2,3)
F. Crown and root studies of Ribes bushes
G. Dissemination of Ribes seeds
H. Miscellaneous studies

A. Ribes Reestablishment in Stream Type after Logging.

This study was begun in 1929 on a 6-acre plot logged in 1929, and upon which a check has been made to ascertain the number of Ribes which have germinated since 1930. In addition, the amount of live stem has been recorded. This plot is located on a branch of the North Fork of the Tuolumne River near Strawberry on the Stanislaus National Forest.

The results are given in the following table:

George A. Root
Associate Pathologist

INTRODUCTION

As in the previous year, the ecology work was confined to choosing

The writer was aided by two members of the blister rust personnel,

A. Ribes reestablishment in stream type after logging
B. Ribes reestablishment after eradication on cut over land
C. Ribes growth and germination
   1. On a non-eradicated logged off area
   2. On an eradicated virgin area
D. Ribes seed germination and seedling survival
E. Ribes seed storage in the duff and soil (1,2,3)
F. Crown and root studies of Ribes bushes
G. Dissemination of Ribes seeds
H. Miscellaneous studies

This study was begun in 1929 on a 6-acre plot logged in 1929, and

The results are given in the following table:

TABLE NO. 1

RIBES ESTABLISHMENT IN STREAM TYPE
AFTER LOGGING

COW CREEK SAMPLE PLOT NO. 1

STANISLAUS CALIFORNIA

Number of Ribes per Acre

Ribes Species	Old Bushes Found in '30-'33	Old Bushes Found in 1934	Germinating in 1929 Found in '30-'33	Germinating in 1929 Found in 1934	Germinating in 1930 Found in '30	Germinating in 1930 Found in '31-'33	Germinating in 1930 Found in 1934	Germinating in 1931 Found in '31	Germinating in 1931 Found in '32-'33	Germinating in 1931 Found in 1934	Germinating in 1932 Found in '32	Germinating in 1932 Found in '33	Germinating in 1932 Found in '34	Germinating in 1933 Found in 1933	Germinating in 1933 Found in 1934	Germinating in 1934 Found in 1934
R. roezli	35.0	2.0	15	6.0	230	34.0	5.0	321	48.0	5.0	100	10	9	39.0	29	23.0
R. nevadense	16.0	.3	8	2.0	365	16.0	2.0	284	39.0	1.0	15	4	3	3.0	23	9.0
R. cereum	1.3	.3		.3	7	.6	.2		1.0	1.2						
Totals	52.3	2.6	23	8.3	602	50.6	7.2	605	88.0	7.2	115	14	12	42.0	52	32.0
Feet of Live Stem per Acre																
R. roezli	314.0	11.0	46	30.0	46	64.0	23.0	64	25.0	16.0	10	3	29	4.0	20	2.3
R. nevadense	150.0	12.0	14	23.0	70	38.0	7.0	57	16.0	3.0	1	1	7	.3	16	.9
R. cereum	3.0	3.0		2.0	1	.6	.7		1.6							
Totals	467.0	26.0	60	55.0	117	102.6	30.7	121	42.6	19.0	11	4	36	4.3	36	3.2

Seedlings have been recorded as having .1 foot of live stem

Table No. 1

Trees Established in Prairie Plots

Number of Trees per Acre

| Species | Original Number | Number Dead in 1929 | Number Dead in 1930 | Number Dead in 1931 | Number Dead in 1932 | Number Dead in 1933 | Number Dead in 1934 | Number Dead in 1935 | Number Dead in 1936 | Number Dead in

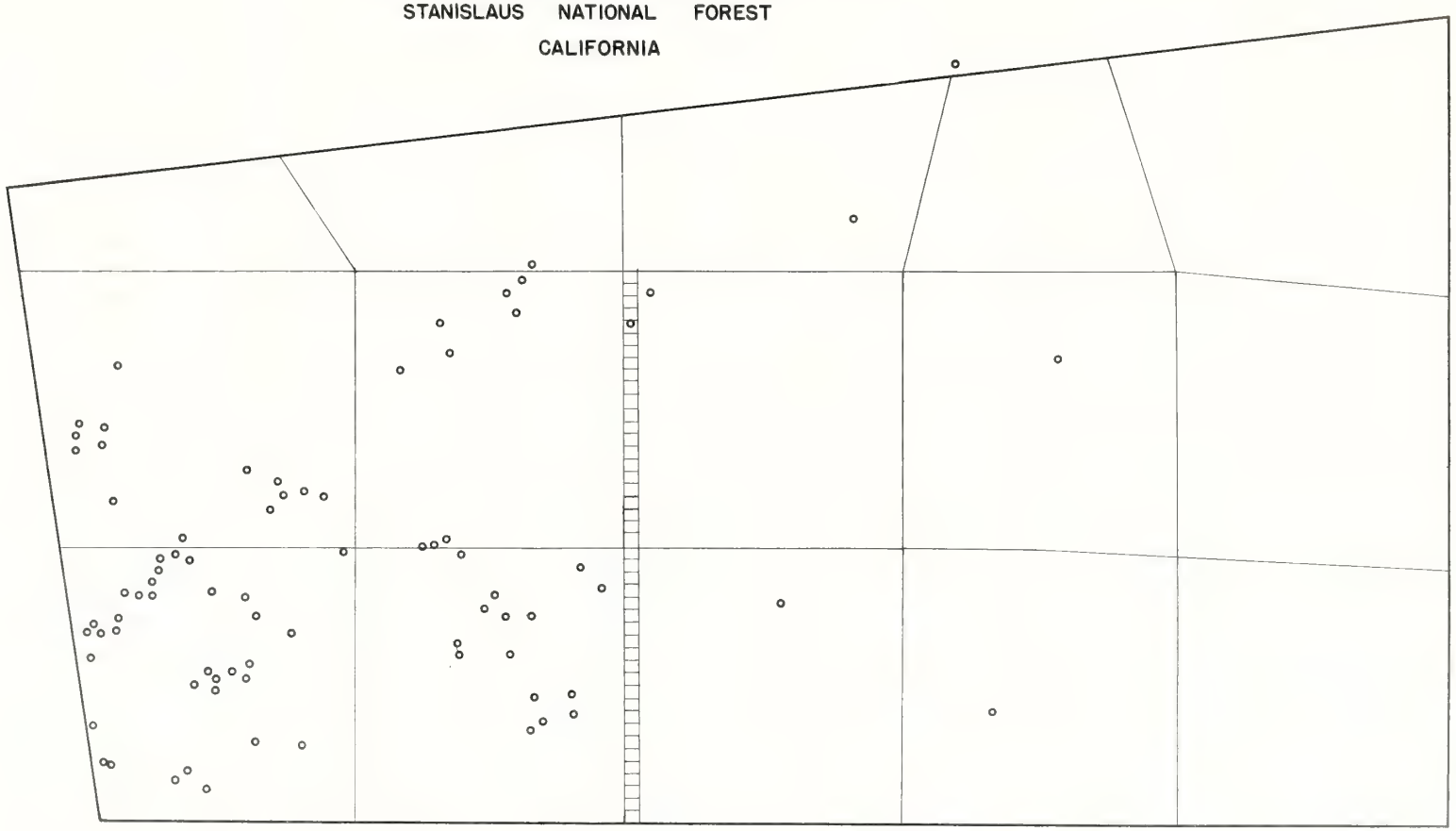
RIBES DISTRIBUTION MAP

OF

COW CREEK SAMPLE PLOT NO. 12

STANISLAUS NATIONAL FOREST

CALIFORNIA



SCALE

FEET 30 60

o = Ribes Bush

Ribes Data by G. A. Root

Drawn by W. Wagner

ANNUAL REPORT 1934

G. A. ROOT

140

Ribes seeds are still germinating, but in diminishing numbers. It is still difficult to find all the seedlings during the same year in which they germinate. Many of these are found the following year. In spite of intensive search, bushes of considerable size are found in the dense brush from year to year. With the increase of brush the finding of the bushes is made that much more difficult though this is compensated for by increased live stem and visibility.

After a 5-year check one perceives comparatively few bushes which germinated in 1929, the year in which the area was logged. In 1930 there was a large increase, followed in 1931 by a slightly greater one. In 1932 there was a considerable drop and in 1933 a marked decrease. Observations show further diminished numbers in 1934, although one may expect to find some germination even in 1935, the seventh year after logging.

B. Ribes Reestablishment after Eradication on Cut Over Land.

This represents a study of a 1.6-acre plot in a sugar pine-fir type, cut over in 1925 and established in 1930 at Cow Creek on the Stanislaus National Forest. With 1,476 heavily fruiting bushes per acre removed in 1930 subsequent checks as to seedlings and bushes were made each year with the exception of 1932. All bushes found were removed each year. The results have been recorded in the following form:

TABLE NO. 2

RIBES REESTABLISHMENT AFTER ERADICATION ON CUT OVER LAND

Per Acre								
Original No. Bushes 1930	Seedlings Found in				Other Bushes			
	1931	1932	1933	1934	1931	1932	1933	1934
1,476	19,053		7,549	8,006	32		*1,406	*311

*Most of these were seedlings the previous year.

The number of seedlings found during the third and fourth year after bush removal is quite constant in this case. Many of these seedlings were found in groups of 60 to 100 or more, indicating the location of rodent caches.

C. Ribes Growth and Germination.

1. On a non-eradicated logged-off area: This is a continuation of a study of the 10-acre Cow Creek Plot on the Stanislaus Forest. This area is a sugar pine-yellow pine type, logged in 1923 and first checked in 1928. All bushes have been staked as found each year.

In 1928 there were 82 bushes on the plot, in 1934 there were 185, two of them having died since 1933. Seven bushes showed dying stems in 1934 and four new bushes were found this year. In 1933, there were 181 bushes, 90 of which were fruiting. In 1934, 107 were bearing fruit. All bushes on the plot were Ribes roezli except six of which there were one R. nevadense, two R. viscosissimum, and three R. cereum.

Ribes seeds are still germinating, but in diminishing numbers. It is still difficult to find all the seedlings during the same year in which they germinate. Many of these are found the following year. In spite of intensive search, bushes of considerable size are found in the dense brush from year to year. With the increase of brush the finding of the bushes is made that much more difficult though this is compensated for by increased live stem and viability.

After a 5-year check one perceives comparatively few bushes which germinated in 1934, the year in which the cover was cutout. In 1935 there was a large increase, followed in 1937 by a slightly greater one. In 1938 there was a considerable drop and in 1939 a marked decrease. Observations show further diminished numbers in 1934, although one may expect to find some germination even in the 1938 seventh year after logging.

4. Ribes Reestablishment after Eradication on Cut Over Land.

This represents a study of a 1.6-acre plot in a super pine-fir type, cut over in 1925 and established in 1930 at Dow Creek on the Stanislaus National Forest. To seedlings and bushes were numbered each year with the exception of 1934. All found were removed each year. The results have been recorded in the following form:

TABLE NO. 2

RIBES REESTABLISHMENT AFTER ERADICATION ON CUT OVER LAND

Original No.	Seedlings Found in				Other Ribes		
Plants 1930	1938	1936	1934	1932	1930		
1,476	10,083		7,849	6,006	32	*1,406	*321

*Most of these were seedlings the previous year.

The number of seedlings found during the third and fourth year after bu removal is quite constant in this case. Many of these seedlings were found in groups of 50 to 100 or more, indicating the location of rodent caches.

5. Ribes Growth and Germination.

In 1938 there were 83 bushes on the plot. In 1934 there were 185, two of stalked as found each year.

Observations on this plot in 1934 show:

a. That the number of bushes have remained about the same for two years.
b. That dying bushes are being compensated for by gradual establishment of new ones.
c. That the brush is getting heavy enough to cause a gradual dying of stems and producing bushes of a spindly type.

2. On an eradicated virgin area: This represents a study on a 5.6-acre plot, mapped in 1930 by the California Forest Experiment Station. On it were recorded all vegetation including Ribes. It is in a virgin forest type and adjacent to the 10-acre Cow Creek Sample Plot which has been studied for the past seven years. It was the intent to stake the 156 Ribes on this plot and compare their growth and other characteristics with those on the 10-acre plot from which the timber had been removed. A crew eradicated the Ribes from this 5.6 acre plot in 1933, but enough bushes were missed or cut off whereby a worthwhile study could be started in 1934. On this plot were found 24 missed bushes averaging eight feet of live stem and four were fruiting. In addition, there were 55 sprouts averaging four feet of live stem and six seedlings of 1934 origin. All have been staked and will be checked at least every other year.

D. Ribes Seed Germination and Seedling Survival.

This study was originally begun to determine the effect of soil disturbance on Ribes germination. Observations over a period of several years proved that the greater the soil disturbance, the greater the germination. A total of nine plots were established, two of which were divided into irrigated and non-irrigated portions.

This study was continued and evolved into one to find the percentage of seedlings which survive from year to year.

TABLE NO. 3

RIBES SEED GERMINATION AND SEEDLING SURVIVAL
IRRIGATED AND NON-IRRIGATED PLOTS

Year Plots Established	No. Ribes Found in 1933	No. Ribes Found in 1934	Number of Deaths	Survival Per-centage	No. of Seed-lings Found in 1933	No. of Seed-lings Found in 1934
1929 Non-Irrigated	61	22	39	36.0	46	6
1929 Irrigated	107	72	35	67.2		1
1930 Non-Irrigated	3	2	1	66.6	3	
1930 Irrigated	79	60	19	75.9	3	
Totals or Averages	250	156	94	62.4	52	7

Observations on this plot in 1934 show:

a. That the number of mature vines remains about the same for the past
b. That dying brushes are being compensated for by gradual establishment
of new ones.
c. That the brush is growing rapidly enough to maintain a gradual filling of
stems and producing bushes of a spindly type.

3. On an eroded virgin area: This represents a study on a fire-swept
cleared in 1930 by the California Forest Experiment Station. It is more restricted
vegetation including Ribes. It is in a virgin forest type and adjoins to the
10-acre Dow Creek Plots which has been studied for the past seven years. It
was the intent to stake the IRC Ribes on this plot and compare their growth and
other characteristics with those on the 10-acre plot from which the timber had been
removed. A crew established the Ribes from this 5.0 acre plot in 1933, and enough
bushes were missed or not dug wholly to establish study count be digging in 1934.
On this plot were found 94 missed bushes averaging eight feet at five and four-
were fruiting. In addition, there were 82 dormant overaging four feet of live
vigor and six seedlings of 1934 origin. All these have checked and will be checked
at least every other year.

4. Vines Used Germination and Seedling Survival.

This study was originally begun to determine the effect of soil disturb-
ance on Ribes germination. Observations over a period of several years proved
that the greater the soil disturbance, the greater the germination. A total of
nine plots were established, two of which were divided into triplicated sec-
tripled portions.

This study was continued and carried into one to find the relative of
seedlings which survive from year to year.

TABLE NO. 3

RIBES SEED GERMINATION AND SEEDLING SURVIVAL
IRRIGATED AND NON-IRRIGATED PLOTS

Year Plots Established	No. Vines Found in 1930	No. Vines Found in 1934	Number of Years Survived	Survival Percentage	No. of Seedlings Found in 1935	No. of Seedlings Found in 1934
1930 Non-Irrigated	61	25	5	36.0	45	8
1930 Irrigated	107	72	5	67.2		1
1930 Non-Irrigated	3	2	1	66.6	3	
1930 Irrigated	75	50	1	72.0	3	
Totals or Averages	250	156	24	60.4	51	9

The remaining seven plots are grouped together as one unit - three established in 1929 and four in 1930.

TABLE NO. 4

RIBES SEED GERMINATION AND SEEDLING SURVIVAL

Year Plots Established	No. Ribes Found in 1933	No. Ribes Found in 1934	Number of Deaths	Survival Percentage	No. of Seedlings Found in 1933	No. of Seedlings Found in 1934
1929	320	274	46	85.6	13	9
1930	64	11	53	17.1	40	6
Totals or Averages	384	285	99	74.2	53	15

In 1933 Annual Report page 170, table No. 4, "No. of Seedlings Found in 1933" should be 307 instead of 248.

A study of table No. 3 shows that: (1) the survival of bushes on the irrigated portion of the plots continues to be greater than on the non-irrigated portions; (2) the number of seedlings has greatly decreased since last year, giving evidence that probably most of the viable seeds have germinated after six years in the ground.

In table No. 4 one perceives a considerable decrease in the number of seedlings compared with 1933, with a corresponding decrease in the number of bushes on the plots.

E. Ribes Seed Storage in the Duff and Soil.

1. The purpose of this study, undertaken in 1931, was to ascertain whether Ribes seed could remain and germinate in the top layer of loose needles; in the middle layer consisting of compact humus, and in the third layer of mineral soil.

Studies thus far have shown that no germination has taken place in the top layer, a little germination occurs in the second layer, and a considerable amount in the third layer.

Additional studies have shown that Ribes seeds planted in a mixed duff and mineral soil show good germination, but to a greater degree when these seeds are covered to a depth of one half to one inch of soil. Seeds placed on top of soil must seemingly await coverage of some kind before germination.

Seeds planted in a compartment consisting wholly of red volcanic ash have not germinated. No seedlings have appeared in another where the medium consisted of fine ash and burned mineral soil.

2. A study of scarification strips, established in 1931, have given little or no results of value. Two strips on the Lassen National Forest first checked this year, showed no germination. On only one strip of six established did Ribes

Year Plots Established	No. Trees Found in 1935	No. Trees Found in 1936	Per Cent Survival of Seedlings	No. of Trees Showing Frost Injury in 1935	No. of Trees Showing Frost Injury in 1936
1934		74	45	55.8	17	5
1935	64	11	52	17.1	10	4
Totals or Average	464	85	98	18.3	27	9

In 1935 annual report page 170, table No. 4, No. of seedlings found in 1935 should be 307 instead of 246.

A study of table No. 3 shows that: (1) the survival of trees on the irrigated portion of the plot, continued to be greater than on the non-irrigated portions; (2) the number of seedlings was greatly increased since last year, giving evidence that probably most of the viable seeds have germinated after two years in the ground.

In table No. 4 one perceives a considerable decrease in the number of seedlings compared with 1934, with a corresponding decrease in the number of frosts on the plots.

5. Tilden Test Survey in the Gulf and Soil.

1. The purpose of this study, undertaken in 1933, was to determine whether seed could remain and germinate in the top layer of loose material in the middle layer consisting of compact humus, and in the third layer of mineral soil.

Studies thus far have shown that no germination has taken place in the top layer, a little germination occurs in the second layer, and a considerable amount in the third layer.

Additional studies have shown that these seeds planted in a mixed soil and mineral soil some germination, but to a greater degree when these seeds are covered to a depth of one half to one inch of soil. Seeds placed on top of soil must seemingly await covering of some kind before germination.

Seeds planted in a compartment containing mostly of red volcanic ash have not germinated. No seedlings have appeared in another where the medium consisted of fine ash and burned mineral soil.

6. A study of sterilizing strips, established in 1931, have given little or no results of value. Two strips on the Lassen National Forest showed that during this year, showed no germination. On only one strip of six established did Mines

seedlings appear and these were very few in number. For some reason this light scarification of the soil did not cause the germination expected, possibly due to lack of seeds in the particular areas thus disturbed.

3. In 1931 four plots 8'x8' were established where the soil was spaded and approximately 2,500 seeds of 1931 growth planted in each plot. All were screened to prevent rodent damage. In 1932 there was an average of 21 seedlings per plot; in 1933, nearly 100 seedlings, and in 1934 about the same number. A few of the seedlings survived, but most of them succumbed during the same year of germination. Two of these plots, well exposed with soil containing little humus, have shown very little germination.

F. Crown and Root Studies of Ribes Bushes.

During 1930 and 1931 five plots were established on which bushes were subjected to various degrees of mutilation.

In 1934 only one plot remained on which the progress of regeneration might be watched. The other plots of Ribes had either been eradicated or subjected to roving stock to such an extent as to make further study impossible. As valuable information, however, had been obtained before this year, they served their purpose.

The plot established in 1931, and remaining intact in 1934, showed that 90 percent of the bushes sprouted with stems cut off at the crowns, but left exposed; 63 percent sprouted with stems cut off at the crowns and covered with dirt; none sprouted with crowns cut off and roots exposed, and 3 percent sprouted with crowns cut off and covered with dirt.

It is of interest to record that of the 90 bushes originally treated in 1931, 48 sprouted and 38 were bearing fruit in 1934. In addition, these 48 bushes originally had an average of 63 feet of live stem; in 1933, but 13 feet. This shows that in two years' time at least, the number of feet of live stem for sprouts do not equal the original live stem of the bush.

G. The Dissemination of Ribes Seeds.

In 1931 a circular plot thirty feet in diameter, and containing a group of approximately 100 R. roezli bushes was laid out near Round Valley on the Lassen National Forest. Strips four feet wide, originating at the center of the circle and running in the four cardinal directions, divided this plot into four quadrants. Bushes were removed on these strips within the circle and within a radius of one half mile outside of it. Ribes bushes were left only on the quadrants.

The plot is in mature timber near a meadow, fairly open on level ground. A wood road partially cuts this circle and sheep traverse this area so the soil is fairly well disturbed at the time germination of seeds would occur.

The purpose of this study is to determine the distance Ribes seeds are disseminated. How far will Ribes bushes be found outside of the quadrants?

This plot was checked in 1934 and 11 seedlings, six 2-year old bushes and one 3-year old bush were found on the eradicated strips within the 30 foot

lack of seeds in the particular areas thus disturbed.

8. In 1951 four plots 4'x4' were established where the soil was cleared and approximately 3,500 seeds of 1000 crowns planted in each plot. All were treated to prevent rodent damage. In 1953 there was an average of 21 seedlings per plot in 1954, nearly 100 seedlings, and in 1956 about the same number. A few of the seedlings survived, but many of them succumbed during the same year of germination. Two of these plots, well exposed with full ventilation (plots three, four shown very little germination.

5. Crown and Root Studies of Pikes Bunches.

During 1934 and 1935 five plots were established on which bunches were employed in various degrees of mutilation.

In 1936 only one plot remained on which the progress of regeneration might be watched. The other plots of Pikes had either been eradicated or were lacking to revive stock to such an extent as to make further study impossible. As valuable information, however, had been obtained before this year. They served their purpose.

The plot established in 1931, was remeasured in 1936. showed that 80 percent of the bunches covered with sharp cut off at the crowns, but left exposed; 83 percent sprouted with stubs cut off as the crowns and covered with dirt; none sprouted with crowns cut off and roots exposed, and 5 percent sprouted with crowns cut off and covered with dirt.

It is of interest to record that of the 50 crowns originally treated in 1931, 49 sprouted and 32 were bearing fruit in 1934. In addition, three 40 Pikes originally had an average of 65 feet of live stem; in 1936 but 12 feet. This shows that in two years' time at least, the number of feet of live stem for sprouts do not equal the original live stem of the bush.

6. The Disconnection of Pikes Roots.

In 1931 a trench four feet to diameter and containing a trunk of approximately 150 T. Yeall bunker was laid out near Stock Valley on the Cheyenne National Forest. Strips four feet wide, originating at the center of the circle and running in the four cardinal directions, divided this plot into four quadrants. Bunches were removed on these strips within the circle and within a radius of 12. Pikes bunches were left only on the circumference.

The plot is in mature timber over a meadow, fairly open on level ground. A wood road partially cuts this plot and also traverse this area on the soil is fairly well disturbed at the time construction of these roads.

The purpose of this study is to ascertain the tightness Pikes bunch are disconnected. How far will Pikes bunches a fence outside of the quarters?

This plot was planted in 1936 and it was first, six years old. Snakes and one 6-year old bush were found on the established strips within the 50 foot

diameter circle. Outside of this circle within a 10 foot zone, 11 seedlings, five 2-year old and two 3-year old bushes were found. It is evident that a little germination took place the same year of eradication and continued each year, but that many seedlings succumbed the same year of germination. Bushes were not found a great distance from the heavily fruiting bushes on the quadrants. Gophers accounted for a small group of seedlings on one of the strips. Seedlings have come up mostly where the large bushes were removed in 1931, which created soil disturbance.

H. Miscellaneous Studies.

1. In 1929 several hundred R. roezli fruits were placed in wooden boxes, one simply on top of the ground and one buried flush with the top of the ground. No germination has taken place in the first box, but seedlings in the second have occurred each year since 1931. The box on top of the ground has a wooden cover, the one flush with the ground is simply covered with wire screen.

In 1931 R. roezli fruits were placed in two boxes and buried in the ground to a depth of about 1 foot. One had a wooden cover, and the top of the other was a wire screen. By 1934 no germination had taken place in either. Quite likely non-germination is due to lack of light or some other conditions not conducive to Ribes germination and growth.

2. No new developments have occurred in the study of the depth at which Ribes seeds may be planted and still germinate. A check in 1934 reveals bushes at the 1-inch stake on one plot and at stakes representing depths from ¼ inch to 2½ inches on two other plots.

3. Under section D, which embraces a study of Ribes on nine enclosed plots, a considerable number of bushes have been staked and recorded. These will be checked from year to year to ascertain the growth of live stem, fruiting habits, and other characteristics which may be of practical value in the eradication work. In this group are R. nevadense as well as R. roezli.

SUMMARY

A. In stream type a few Ribes seedlings will appear the same year as timber is logged if this is done early in the season; reach a maximum the first and second year following logging and then gradually diminish. Germination still takes place the fifth year but in greatly reduced numbers.

B. On cut over land in the sugar pine-fir stand where eradication does not take place until four or five years after logging, there is a chance for a large number of heavily fruiting bushes to develop. When these are eradicated but not removed from an area, countless numbers of seeds are left which reach a maximum germination the first and second year following eradication and then decline. Seedlings continue to appear four years after in fairly large numbers.

C. Shading-out by brush on a logged off area, where eradication has not been done, has caused but few bushes to die out in eleven years. The shading-out process, however, is commencing to manifest itself in the spindly type of Ribes bush now developing.

In this group are E. neavedense as well as E. roesli.

SUMMARY

D. Moisture is a factor in prolonging the life of seedlings. Seeds continue to germinate five years after planting.

E. Ribes seeds germinate more readily in mineral soil than in duff or loose layers of coniferous needles.

F. A large percentage of bushes cut off at the crowns and left exposed come back as sprouts. When crowns are covered with dirt there is a decrease in the number which sprout. Excessive heat to which the soil over these crowns is sometimes subjected may account for some of this mortality. Several years elapse before the number of feet of live stem of sprouts equal the original live stem of the bushes decapitated.

G. Ribes seeds may germinate and push their way through two and one-half inches of soil.

H. Ribes seeds continue to germinate after five years, buried in an open box, (screen covered) flush with the ground. No germination has taken place in a box covered with one foot of soil.

RIBES ERADICATION IN CALIFORNIA
1934

By
W. V. Benedict
Forester

INTRODUCTION

Prior to 1933, Ribes eradication work in California was entirely experimental in character. The small scale work done between 1926 and 1932 (covering initial eradication on 37,214 acres and reeradication on 14,375 acres) consisted primarily in the development of effective control methods for the sugar pine belt, the accumulation of cost figures for the different sugar pine types encountered and an appraisal of the blister rust control problem confronting the region. The year 1933 saw the establishment of practical control work on a moderately large scale basis, brought about partially by the consummation of the experimental work but more particularly by the availability of an adequate supply of labor by the institution of the Civilian Conservation Corps and Public Works Administration, unemployment relief agencies of the Government. During 1933, an additional 33,815 acres of sugar pine type were given initial protection and 5,900 acres reworked, bringing the total acreage treated at the advent of the 1934 season to 71,029 acres of initial working and 20,275 acres of reworking.

For the field season of 1934 the Bureau of Entomology and Plant Quarantine had available for blister rust control work in California $237,000 of Public Works Administration funds (the original PWA allotment was made to the Bureau of Plant Industry and the transfer of funds was made coincidental with the transfer of the Blister Rust office from Plant Industry to Entomology and Plant Quarantine on July 1). For this same period the Forest Service had a similar Public Works allotment of $271,681.97. The funds of the Bureau were designated specifically for use on state and private lands and those of the Forest Service for expenditure on national forest lands. Because of the fact that private and Federal holdings are so generally intermingled in the sugar pine region, it was mutually decided that the most effective procedure in developing a coordinated control program for the state as a whole was to pool the funds. Accordingly, the Bureau assigned to the Forest Service $186,000 of its funds which represented the portion of its total allotment which was available for carrying on the duties assumed by the Forest Service in this joint program. The remaining $51,000 of Bureau funds was retained by the Bureau to care for the salaries and expenses of its supervisory field force, both permanent and temporary, and the maintenance of a control reconnaissance party. The Forest Service also retained $1,837.44 of its allotment in the Regional Office to pay for increased clerical help, field expenses of supervisory overhead and purchase of equipment chargeable directly to the Forest Service. The net total of the joint fund available for field work in 1934 was, therefore, $455,844.53. This sum was assigned to the three forests on which control work was planned as follows: Plumas $152,000, Stanislaus $152,000, and Eldorado $151,844.53. Expenditures made from each

1934

by

E. V. Benedict

Forester

allotment are shown in table No. 1. In addition to the $34,858.94 of Bureau funds expended on the control operation, $2,195.02 was expended on Emergency Conservation cooperative work and $13,946.04 on blister rust reconnaissance, which accounts for the remainder of the $51,000 retained by the Bureau.

TABLE NO. 1

EXPENDITURES BY APPROPRIATIONS AS OF DECEMBER 31, 1934

Appropriation	Net Amount Available For 1934 Field Work	Expenditures	Balance
Forest Service Impnira	$269,844.53	$268,123.71	$1,720.82
*Entomology NIRA	186,000.00	175,419.83	10,580.17
Total joint fund	455,844.53	443,543.54	12,300.99
**Entomology NIRA	34,858.94	34,858.94	-
Totals	$490,703.47	$478,402.48	$12,300.99

*Disbursed by Forest Service.
**Disbursed by Bureau of Entomology and Plant Quarantine.

ORGANIZATION AND MANAGEMENT

The responsibilities of each cooperator in the prosecution of the joint project were about as follows:

Responsibilities of Forest Service

1. The purchase of trucks and field equipment; non-expendable property prorated to each cooperator on the basis of the amount of funds of each involved.

2. The employment of all men. Camp foremen and checkers were hired in the Regional Office from the Civil Service register; all other labor was secured from the National Reemployment Service at each forest headquarters. Selections in personnel were approved by the blister rust field supervisors and Forest Service.

3. The purchase and transportation of all supplies.

4. The preparation of all vouchers and accounts made against the joint fund. Periodic cost statements as needed by the blister rust supervisor were issued by the Forest Service. A separate ledger account was kept of disbursements against the funds of the Bureau and copies of all disbursement vouchers against these funds were furnished the Blister Rust Office.

TABLE NO. 1

EXPENDITURES BY APPROPRIATIONS AS OF DECEMBER 31, 1934

Appropriation	Net Amount Available For 1934	Expended Year	Balance
Forest Service Income	$838,844.53	$838,128.71	$1,720.82
*Intermingled Area	186,000.00	175,419.83	10,580.17
Total Joint Fund	455,844.53	443,548.54	12,300.99
**Intermingled Area	24,859.44	24,854.44	-
Totals	$480,703.97	$468,402.98	$12,300.99

*Disbursed by Forest Service.
**Disbursed by Bureau of Entomology and Plant Quarantine.

ORGANIZATION AND MANAGEMENT

The responsibilities of each cooperator in the prosecution of the joint project were about as follows:

Responsibilities of Forest Service

1. The purchase of trucks and field equipment; non-accountable property printed to each cooperator or the basis of the number of trucks of each involved.

2. The employment of all men. Camp foremen and cooksmate were hired in the Regional Office from Civil Service registers; all other labor was secured from the National Reemployment Service at camp former headquarters. Selections in personnel were supervised by the District Chief Supervisors and Forest Service.

3. The purchase and transportation of all supplies.

4. The preparation of all vouchers and accounts made against the joint fund. Periodic cost statements as needed by the District Chief Supervisor were issued by the Forest Service. A separate ledger account was kept of Cooperative agents' funds of the Bureau and copies of all disbursement vouchers against these funds were furnished the District Chief Office.

Responsibilities of Bureau of Entomology and Plant Quarantine

1. The development of a general plan of control to include both Federal and private lands.

2. The preliminary examination of areas to determine working methods.

3. The technical direction of control work. By virtue of the fact that the technical phases of the work are so interlocked with the establishment and maintenance of the service of supply, the organization and management of camps were handled by the Blister Rust staff in accordance with plans mutually approved.

4. The checking of control work to determine its efficiency.

5. The summarization of results.

In the general supervision of the project C. E. Dunston, Assistant Chief of Forest Management, represented the Forest Service, and W. W. Benedict, Forester, the Bureau of Entomology and Plant Quarantine. The Bureau also assigned the following of its regular personnel to the direct supervision of field operations:

Plumas operation -- T. H. Harris, Associate Forester, operation supervisor
Stanislaus -- R. M. Riley, Assistant Forester, unit supervisor
*W. W. Spinney, Junior Forester, unit supervisor

Eldorado operation -- D. R. Miller, Associate Forester, operation supervisor
W. B. Dunshee, Agent, unit supervisor
*Benton Howard, Junior Forester, unit supervisor

Stanislaus operation -- Roy Blomstrom, Associate Forester, operation supervisor
J. C. Ball, Agent, unit supervisor
*Arthur London, Junior Forester, unit supervisor
F. A. Patty, Associate Pathologist, assisted Blomstrom with the supervision by taking direct charge of 3 camps on the southern end of the Stanislaus contiguous to Yosemite National Park.
C. N. Partington, Assistant Pathologist, was in charge of checking work during the first part of the summer, being later transferred to scouting for blister rust in northern California.

The three blister rust operation supervisors were in direct charge of the blister rust activities on the forests to which assigned, working in collaboration with the Forest Supervisor and his assistants under general instructions approved jointly by the Regional Office of the Forest Service, and

*These three men were paid by the Forest Service from the joint blister rust fund from April 12 to August 31 (Spinney to September 9).

the Blister Rust Office. The unit supervisors assumed such duties as were delegated to them by the operation supervisor. Each unit supervisor was assigned a specific group of camps to manage.

Camps varied in size from 25 to 80 men, depending upon the particular working conditions encountered on the ground. The standard road camp consisted of thirty men, with the established NRA pay scale in effect in 1934 shown for each job as follows:

1 camp foreman	$2,600 per year
1 straw boss	75¢ per hour
8 crew leaders	55¢ per hour
17 laborers	45¢ per hour
1 head cook	$1.10 per hour
1 second cook	75¢ per hour
1 flunky	45¢ per hour

All men were charged 25 cents for each meal taken in camp.

The 1934 NIRA operation consisted of 34 camps located on the three national forests as follows:

Plumas -	employing a total of	395 men	in 8 camps
Eldorado -	" " " "	361 "	" 12 camps
Stanislaus -	" " " "	394 "	" 14 camps
	Total	1,150 men	in 34 camps

The number of men shown includes all facilitating personnel such as truck drivers, clerks, warehousemen and checkers in addition to the regular camp roster.

An important departure from the eradication set-up of previous years was the change in the construction of the camp which, in 1934, was more elaborate in design and refinements than earlier camps. During the 1933 field season when large numbers of unemployment camps of one type or other were being established, a growing need for a more elaborate type of blister rust camp arose in California. Accordingly, when plans were formulated for the 1934 eradication work, special attention was given to the development of more suitable living quarters in the field. In the preparation of designs it was necessary to recognize two general types of camp-- (1) the permanent camp located along motor roads, and (2) the pack camp inaccessible to motor transportation and relying entirely upon pack animals for supplies and equipment and frequently moving one or more times per season. Of necessity this latter type of camp was more simple in construction. Pack camps were similar in design to previous blister rust camps, utilizing only a minimum amount of short length lumber and other construction materials, since it was necessary to consider the expense and problems of transportation by pack animals.

All road camps conformed to a standard plan of construction involving a combination screened and boarded fly-proof kitchen and mess with

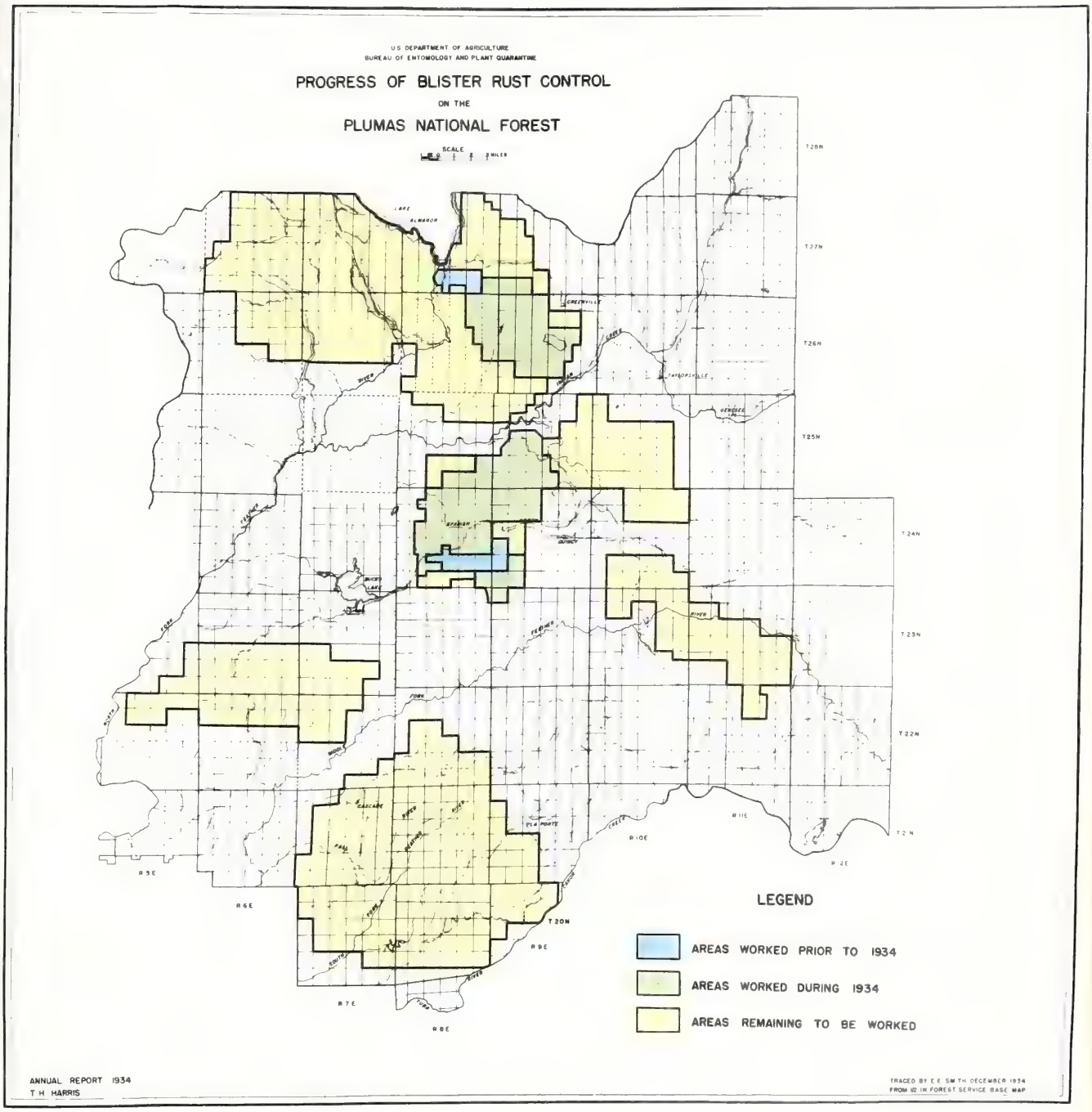
1 camp foreman.....$2,600 per year
1 straw boss.....75¢ per hour
8 crew leaders.....55¢ per hour
17 laborers.....45¢ per hour
1 head cook.....$1.10 per meal
1 second cook.....75¢ per hour
1 flunky.....45¢ per hour

All men were charged 25 cents for each meal taken in camp.

The 1936 MIRA operation consisted of three camps located on the Kaibab national forests as follows:

Pinyon	- employing a total of	35m	men in	6	camps
Ridgetop	- " " " "	351	" "	12	camps
Stanislaus	- " " " "	394	" "	16	camps
Total		1,180	men in	34	camps

The number of men shown includes all foodhandling personnel such as truck drivers, clerks, warehousemen and carpenters in addition to the regular camp roster.


U.S. DEPARTMENT OF AGRICULTURE
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
PROGRESS OF BLISTER RUST CONTROL
ON THE
PLUMAS NATIONAL FOREST
SCALE
T28N
T27N
T26N
T25N
T24N
T23N
T22N
T2N
R5E
R6E
R7E
R8E
R9E
R10E
R11E
R2E
T20N
LEGEND
AREAS WORKED PRIOR TO 1934
AREAS WORKED DURING 1934
AREAS REMAINING TO BE WORKED
ANNUAL REPORT 1934
T H HARRIS
TRACED BY E E SMITH DECEMBER 1934
FROM 12 IN FOREST SERVICE BASE MAP

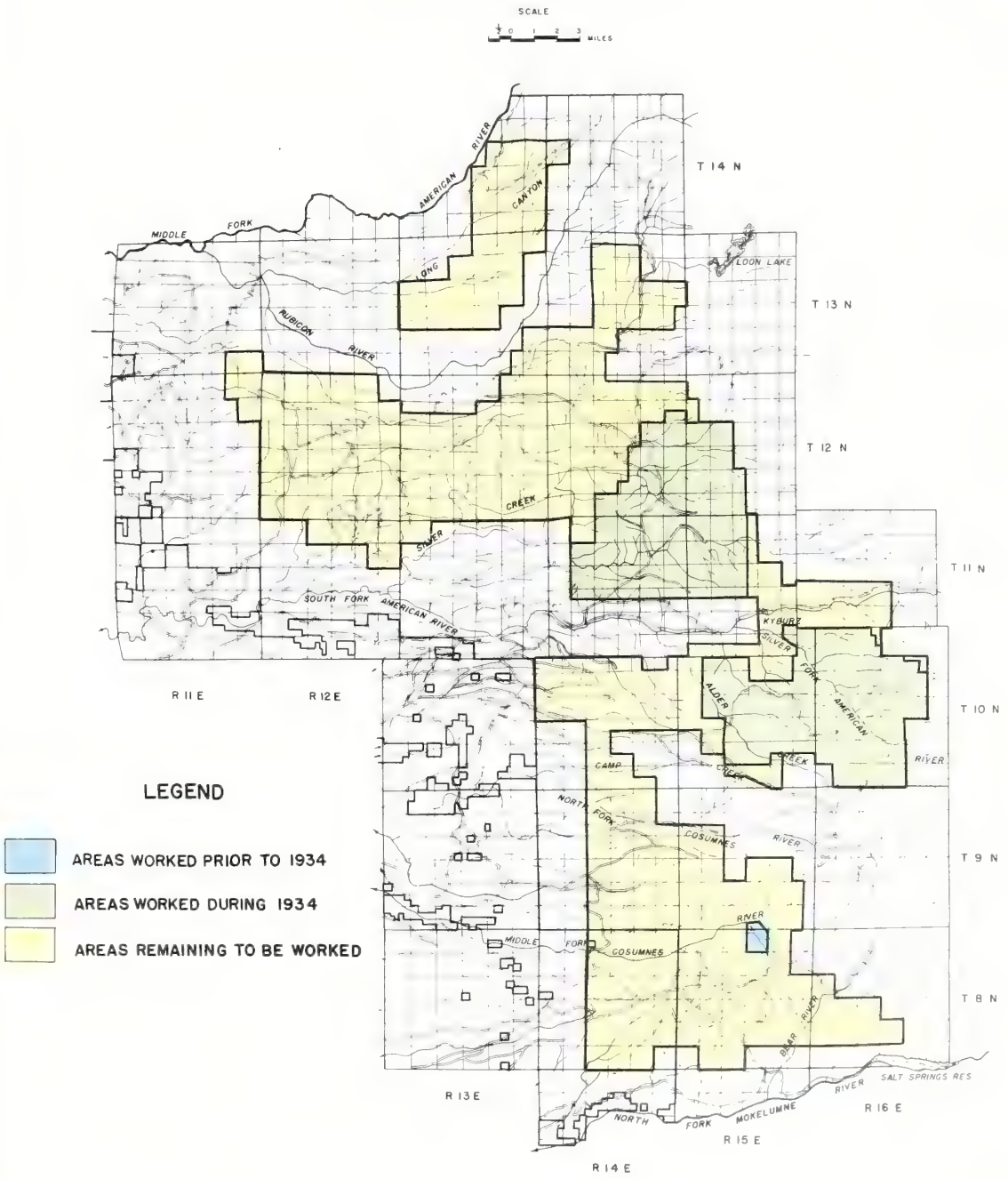
U. S. DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

PROGRESS OF BLISTER RUST CONTROL

ON THE

ELDORADO NATIONAL FOREST



ANNUAL REPORT 1934

D R MILLER

tarpaulin covering, hot and cold running water in the kitchen and shower bath, and fly-proof meat house, refuse pit and latrines. For the type of camp construction used on the Eldorado and Stanislaus operations the average cost of setting up a 30-man road camp was $296.00 and for a 25-man pack camp the cost was $100.00. These cost figures include construction materials and labor in camp site clearing and setting up the camp. For the Plumas operation, where a somewhat more elaborate type of camp was built, and where the camps were of larger size, the average cost of a 50-man camp was $425.00.

LOCATION AND DESCRIPTION OF AREAS

The areas selected for control work were chosen in accordance with a general policy of giving first attention to the high value, sugar pine areas in the optimum range of the species. Consideration was also given to the proportion of Federal and private lands in the control units and working boundaries were so delineated that the ratio of Federal to private land was governed roughly by the available funds of each cooperator, due attention being given to the fact that, for control to be effective, it is essential to treat completely a parcel of land regardless of ownership.

Plumas operation (NIRA)

The Plumas operation was divided into two units of four camps each.

The Quincy unit of roughly 28,500 acres comprises the Butterfly Valley area west of Keddie and the Meadow Valley basin west of Quincy, the two areas being contiguous. The average stand of merchantable sugar pine on the unit is 5.1 M.B.M. per acre. The principal private holdings are those of the Spanish Peak Lumber Company in Meadow Valley, and the Quincy Lumber Company in Butterfly Valley. Approximately 73 percent of the unit is federally owned. Much of the Butterfly Valley area and the northern part of Meadow Valley have been logged. Except for two sections, initial eradication was completed in the Quincy unit.

The Greenville unit is located in the northern part of the forest just south and west of the town of Greenville. Approximately three-fifths (18,000 acres) of this unit was completed in 1934. The average stand of sugar pine is 9.7 M.B.M. per acre. The principal private owners are the Wolf Creek Timber Company and the Red River Lumber Company; 53 percent of the area is in Federal ownership. Only a few acres have been logged.

Eldorado operation (NIRA)

The Eldorado operation was divided into two units, the Silver Fork of the American River unit and the Silver Creek unit, each with an assignment of six camps.

The Silver Fork unit consists of 29,476 acres of timber land supporting an average of 6.7 M.B.M. sugar pine per acre. The unit was practically completed in 1934. The one large private owner is the Silver Fork Lumber Company; 74 percent of the area is federally owned. The only logging at

tarpaulin covering, hot and cold running water in the kitchen and shower bath, and fly-proof meat house, refuse pit and latrines. For the type of camp construction used on the Eldorado and Sternlaus operations the average cost of setting up a 30-man road camp was $295.00 and for a 50-man peak camp the cost was $100.00. These cost figures include construction materials and labor in camp site clearing and setting up the camp. For the Plumas operation, were of larger size, the average cost of a 50-man camp was $425.00.

LOCATION AND DESCRIPTION OF AREAS

The areas selected for control work were chosen in accordance with a general policy of giving first attention to the high value, short time in the optimum range of the species. Consideration was also given to the proportion of Federal and private lands in the control units and working boundaries were so delimested that the ratio of Federal to private land was governed roughly by the available funds of each cooperator, due attention being given to the fact that, for control to be effective, it is essential to treat completely a parcel of land regardless of ownership.

Plumas operation (MIRA)

The Plumas operation was divided into two units of four camps each.

The Quincy unit of roughly 28,800 acres comprises the Butterfly Valley area west of Keddie and the Meadow Valley basin west of Quincy, the two areas being contiguous. The average stand of merchantable sugar pine on the unit is 5.1 M.B.M. per acre. The principal private holdings are those of the Spanish Peak Lumber Company in Meadow Valley, and the Quincy Lumber owned. Much of the Butterfly Valley area and the northern part of Meadow Valley have been logged. Except for two sections, initial eradication was completed in the Quincy unit.

The Greenville unit is located in the northern part of the forest just south and west of the town of Greenville. Approximately three-fifths (18,000 acres) of this unit was completed in 1934. The average stand of sugar pine is 9.7 M.B.M. per acre. The principal private owners are the area is in Federal ownership. Only a few acres have been logged.

Eldorado operation (Trail)

The Eldorado operation was divided into two units, the Silver Fork of the American River unit and the Silver Creek unit, each with an assignment of six camps.

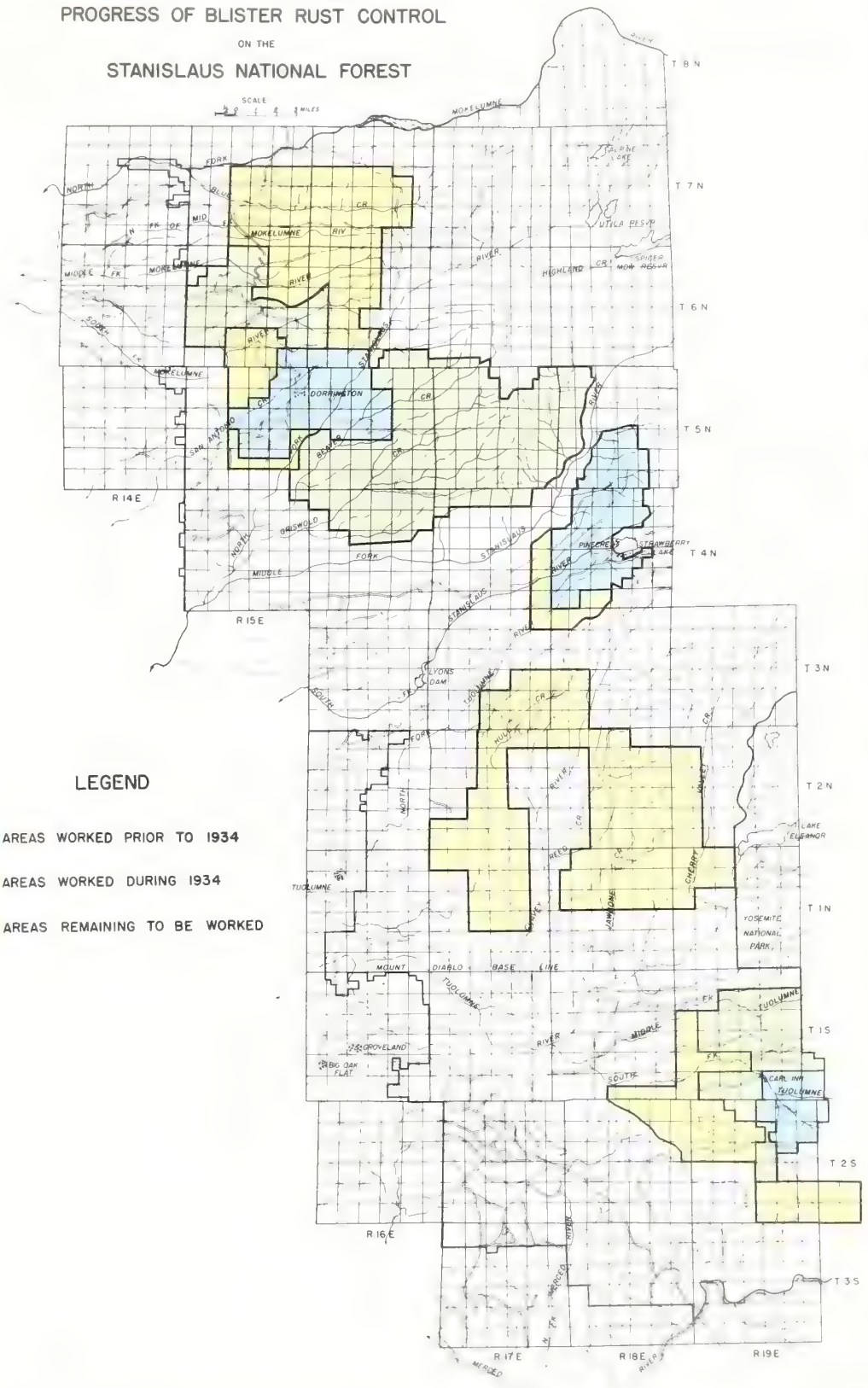
The Silver Fork unit consists of 29,476 acres of timber land supporting an average of 6.7 M.B.M. sugar pine per acre. The unit was practically completed in 1934. The one large private owner is the Silver Fork Lumber Company; 74 percent of the area is federally owned. The only logging at

U.S. DEPARTMENT OF AGRICULTURE
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

PROGRESS OF BLISTER RUST CONTROL

ON THE

STANISLAUS NATIONAL FOREST



LEGEND

- AREAS WORKED PRIOR TO 1934
- AREAS WORKED DURING 1934
- AREAS REMAINING TO BE WORKED

ANNUAL REPORT 1934
R. BLOMSTROM

TRACED BY A LONDON JAN 1935
FROM ½" FOREST SERVICE BASE MAP

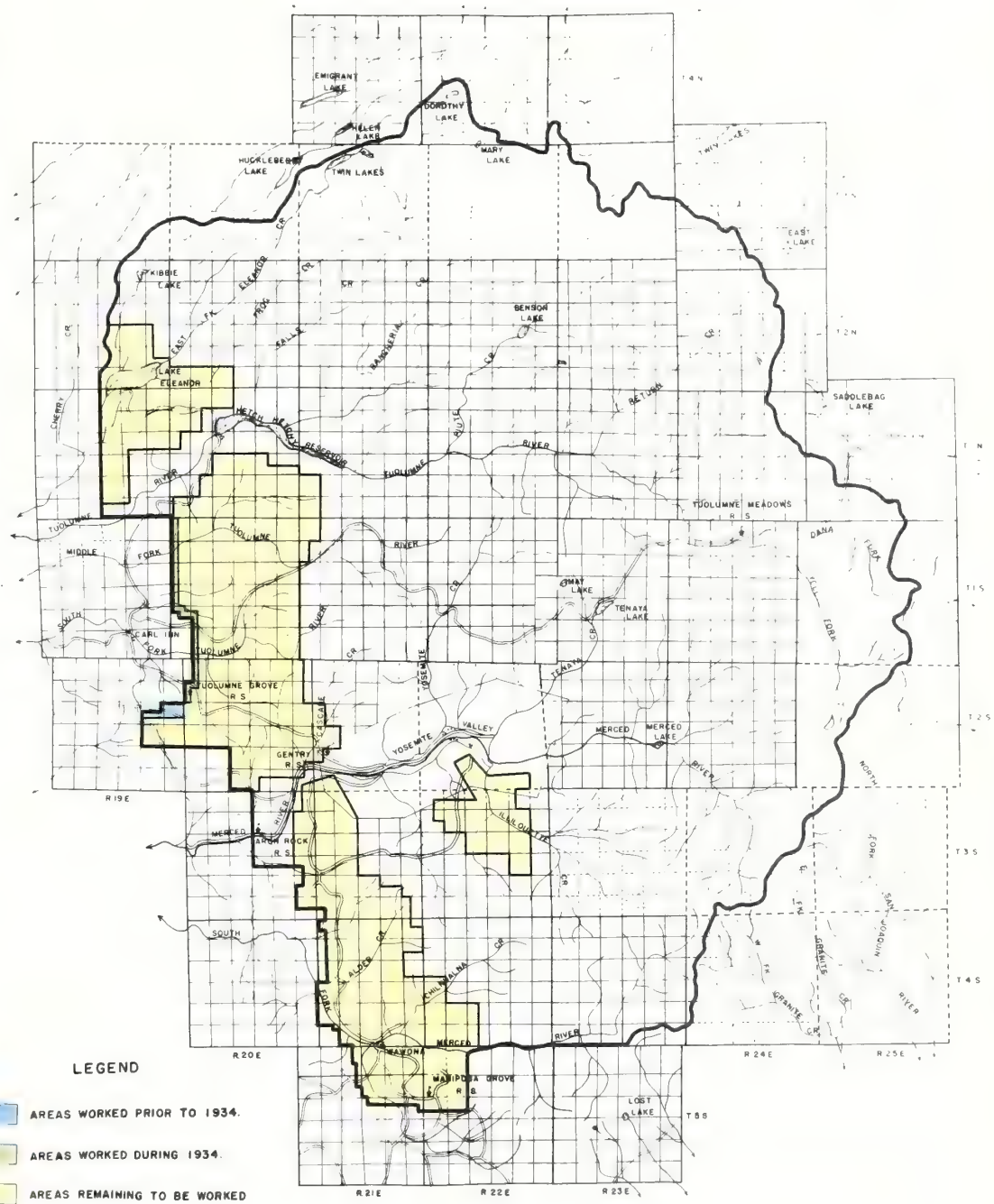
U.S. DEPARTMENT OF AGRICULTURE
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

PROGRESS OF BLISTER RUST CONTROL

ON THE

YOSEMITE NATIONAL PARK

SCALE



LEGEND

- AREAS WORKED PRIOR TO 1934.
- AREAS WORKED DURING 1934.
- AREAS REMAINING TO BE WORKED

ANNUAL REPORT 1934
F.A. PATTY.

TRACED BY C FOWLER FEB 1935
FROM 2 USGS TOPOGRAPHIC MAP

present is a salvage operation at China Flat cutting fire-killed timber on a 2,700-acre burn.

Approximately one-fourth of the Silver Fork unit (29,655 acres) was worked in 1934. Sugar pine averages 8.2 M.B.M. per acre. The Michigan-California Lumber Company is the principal private owner; 33 percent of the area is in Federal ownership. Practically none of the land worked in 1934 is cut over.

Stanislaus operation

1. NIRA.

The NIRA work on the Stanislaus Forest was a continuation of the NIRA work started in 1933. The 1934 operation comprised two units, one large one extending from the Middle Fork of the Stanislaus River on the south to the Middle Fork of the Mokelumne River on the north, and one smaller one between the South and Middle Forks of the Tuolumne River near Carl Inn.

On the Stanislaus-Mokelumne unit, 68,550 acres of sugar pine type, or approximately two-thirds of the total area, were covered in 1934. Sugar pine averages 12 M.B.M. per acre. The principal private timber holdings are those of the Pickering Lumber Company, the Ruggles Estate, and the McArthur-Ducey Company. The Federal Government owns approximately 46 percent of the land. None of the area has been logged to date.

On the Carl Inn unit 16,134 acres were completed in 1934, or about one-half of the sugar pine type in the locality. Sugar pine averages 10 M.B.M. per acre. The important private operation is the Yosemite Lumber Company; 46 percent of the area is Federal. Intensive logging has been done is this region.

2. ECW.

During part of the field season (from June 4 to July 20) a consignment of 15 laborers from the Skull Creek CCC camp was employed on Ribes eradication, working in the Stanislaus unit in conjunction with the NIRA operation.

Yosemite operation (ECW)

The Ribes eradication work completed on Yosemite National Park in 1934, totaling 1,715 acres, was performed entirely by a small assignment of labor from the Merced Grove CCC camp under the direction of the Park Service, the Bureau of Entomology and Plant Quarantine providing general technical supervision. The plan of work outlined by the Park Service consisted of the eradication of Ribes from a strip of around 20 chains wide along the west boundary of the park adjoining the eradication area on the Stanislaus National Forest just across the park border. This narrow belt of land is a segment of the Rockefeller addition to the park and supports excellent sugar pine.

present is a salvage operation at Onion Flat cutting fire-killed timber on a 2,700-acre burn.

Approximately one-fourth of the Silver Fork unit (29,655 acres) was [illegible] in 1904. Sugar pine averages 3.2 M.B.M. per acre. The California Lumber Company is the principal private owner. [illegible] of the area is in Federal ownership. Practically none of the land worked in 1934 is cut over.

Stanislaus operation

1. MIRA.

The MIRA work on the Stanislaus Forest was a continuation of the MIRA work started in 1933. [illegible] operation completed two units, one extending from the Middle Fork of the Mokelumne River on the north, and one smaller one between the South and Middle Forks of the Tuolumne River near Curl Inn.

On the Stanislaus-Mokelumne unit, 68,880 acres of sugar pine type, or approximately two-thirds of the total area, were covered in 1934. Sugar pine averages 12 M.B.M. per acre. The principal private timber holdings are those of the Pickering Lumber Company, the Sugar Pine Lumber Company, and the Eastman-Tacey Company. The Federal [illegible] are approximately 65 percent of the land. None of the area has been logged to date.

On the Carl Inn unit 16,184 acres were completed in 1934, or about [illegible] of the sugar pine is the [illegible]. Sugar pine averaged 12 M.B.M. per acre. The important private operation is the Yosemite Lumber Company; 45 percent of the area is Federal. Intensive logging has been done in this region.

2. NYA.

During part of the field season (from June 4 to July 20) a conservation detachment of 16 laborers from the Skull Creek CCC camp was employed on Ribbe creek [illegible], working in the Stanislaus unit in conjunction with the MIRA operation.

Yosemite operation (ECW)

The Ribbe eradication work completed on Yosemite National Park in 1933, totaling 1,710 acres, was performed entirely by a small detachment of labor from the Merced Grove CCC camp under the direction of the Park Service. The Bureau of Entomology and Plant Quarantine [illegible] supervision. The plan of work outlined by the Park Service [illegible] eradication of Ribes from a strip of around 50 chains wide along the west boundary of the park adjoining the eradication area on the Stanislaus National Forest just across the park border. This narrow belt of land is a segment of the [illegible] addition to the world renowned [illegible] pine.

METHODS OF CONDUCTING FIELD WORK

The procedure in performing Ribes eradication work is completely covered in previous annual reports and only special problems encountered will be discussed here.

In an effort to achieve the maximum accomplishment and to maintain the proper balance between acres treated and efficiency of the work, the general policy followed in Ribes eradication this season was to speed up the first working as much as possible, check the results, and rework the portion of the area not conforming to the prescribed efficiency standards. This system is based upon the fact that a rapid, first working of an area will eliminate from further consideration a high percentage of the total area, and thus save valuable time that cannot be regained when a job is too intensively done at first. By following this procedure there was naturally a considerable amount of reworking and rechecking needed (approximately 15 to 20 percent of the first working), but the results secured, in comparison with a more intensive first working, verify the value of this method.

For all initial work the standard 3-man eradication crew was used. For rework, however, one select man of above average ability functioned most effectively reworking single-handed the portions of the area needing further attention. The only limitations noted in the use of the one-man rework crew were on areas where the original string lines had been completely destroyed by cattle and in areas of dense brush. Under such conditions two and three-man rework crews were used.

A special eradication problem present on the Plumas operation, requiring special working methods, was encountered along certain stream bottoms adjoining meadow lands where dense masses of Ribes inerme occurred growing entangled with willows and alders. In these situations regular eradication methods were not effective and special slashing methods were devised. The following description of the slashing job was prepared by T. H. Harris and R. M. Riley of the Plumas operation.

SLASHING IN WILLOW-RIBES INERME TYPE - MEADOW VALLEY PLUMAS NATIONAL FOREST

"In the Meadow Valley working circle are extensive areas of meadow land which support, particularly along the borders of several streams which traverse it, dense thickets of willow and other species of brush. Scattered through these thickets and inextricably intertwined with the willows were heavy concentrations of R. inerme which constituted a potential menace to the adjacent stands of sugar pine being partly protected from blister rust by upland Ribes eradication. Since these masses of R. inerme-infested vegetation could not be eradicated by the usual hand methods of upland or stream type work, the problem was to devise some modification of these methods which would adequately cope with the situation.

The procedure in performing Sibes eradication work is completely be discussed here.

"Experiments were made with several types of tools with varying results. At the end of the season mattocks; Pulaskis, 2½-lb. short-handled, double-bitted axes; and No. 2 and No. 3 Forester brush cutters were the only tools in regular use. Mattocks were used in open digging and in grubbing roots after the brush had been cleared away. Pulaskis were employed in small, isolated concentrations wherever one man had both brush cutting and grubbing to do. The short-handled axe was found to be superior to the standard, double-bitted axe for brush cutting on account of the smaller material to be cut and the fact that the men were usually working in close quarters. The No. 2 Forester brush cutter was somewhat light for the work, but the No. 3 size was good for opening space for axe work; even in this size, however, the bolt is apt to be sheared off by an unskilled user.

"Several other tools were tried and discarded. Bolo knives were found to be improperly designed for this use and strange to the men. Brush scythes were not capable of cutting the willow branches. A portable, circular saw, powered by a small gasoline motor, was quite capable of cutting brush on the margins of clumps, but the dense mass of stubs left in the ground prevented wheeling the saw into the clumps for further cutting. It is quite possible that this saw--designed by the California Forest Experiment Station--could be developed to meet the needs of this type of work.

"Powder was used very successfully and cheaply in handling large willow stumps which sheltered masses of R. inerme roots. The removal of these stumps by hand would have entailed a large amount of labor. The necessary apparatus consisted of 20 percent stumping powder, dry cell batteries, at least 250 feet of leading wire, No. 20 insulated copper wire for splicing electric cap wires when too short to reach between holes, and No. 6 electric blasting caps. If available, a detonating machine (galvanometer) is preferable to batteries only, since 10 to 50 shots can be set off at once as against only one or two. A wooden stick cut square at one end was used for tamping instead of an iron rod. The charge, one to three sticks of powder per stump, was placed well down under the roots and not too near the surface. A few small stumps were tried first to arrive at a correct loading.

"Experimentation with types of crew organization disclosed that two variations in the 5-man crew were effective according to type of ground cover. In large clumps approaching 100 percent concentration, a 5-man crew was used, each man having a special job. The axe-man devoted his whole time to cutting brush; the second man piled the slashings; the third and fourth men grubbed the Ribes on the cleared areas; the fifth man (crew leader) directed the work of the others and assisted wherever he deemed most necessary.

"In places where Ribes and willow concentrations were light and more or less scattered, or where a minimum of slashing was required, the 5-man crew was less specialized. The crew cut a swath across an area and each man performed whatever operation was necessary to remove the Ribes.

"Experiments were made with several types of tools with varying results. At the end of the season mattocks; Pulaskis, 3-lb. short-handled, double-bitted axes; and No. 2 and No. 3 Forester brush cutters were the only tools in regular use. Mattocks were used in open digging and in grubbing roots after the brush had been cleared away. Pulaskis were employed in small, detailed construction work. The short-handled axe was superior to the standard, long-handled type for most cutting operations. The No. 3 Forester brush cutter was somewhat light for the work, but the No. 2 size was good for opening space for axe work; even in tall brush, however, the bolt is apt to be sheared off by an unskilled user.

"Several other tools were tried and discarded. Bolo knives were found to be improperly designed for this use and strange to the men. Brush axes, powered by a small gasoline motor, were quite capable of cutting the taller growth, but were unwieldy and clumsy, and the noise made it quite hard to hear the ground crew. Both machines were designed by California interests. It is quite possible that this type of machine—designed by one familiar with the situation—could be developed to meet the needs of this type of work.

"Weather was also very important and should be handled intelligently. Under extreme moisture conditions, when trees, brush, and ground cover were soaked by a heavy rain, the fire could be handled by a large number of men with little danger. Under moderate moisture conditions, when the ground cover was dry enough to burn readily, but the trees and brush were still damp, a smaller force could be used. Under extreme dry conditions, when the trees and brush were dry enough to burn readily, the fire could be handled by a small force of men, but the danger was great. Under these conditions, the fire could spread rapidly, and the men had to be constantly on the alert to keep ahead of it. Under such conditions, a small force of men could not control the fire, and a large force was necessary.

"Experimentation with types of crew organization disclosed that two variations in the 5-man crew were effective according to type of ground cover. In large slumps approaching 100 percent concentration, a 5-man crew was used, each man having a special job. The axe-man worked his whole time to actual cutting; the swamper performed all the clearing; the bolter-in directed the operation of the others and assisted wherever he deemed most necessary.

"In places where Ribes and willow concentrations were light and scattered, or where a minimum of clearing was required, the 5-man crew was less specialized. The crew cut a swath across an area and each man performed whatever operation was necessary to remove the Ribes.

"Burning of brush piles was successfully accomplished under the supervision of the Forest Service after the first fall rains. Since a lack of pitchy material in the piles made them difficult to ignite, a Hauck torch was found necessary.

"Significant figures on the number of acres worked per man day were difficult to obtain because of the great variety in types of ground cover which the area presented. Based on the area as a whole, three-tenths of an acre per man day was the coverage secured. The estimate of 55 acres of 100 percent willow-R. inerme concentration indicates a man-day capacity of about .04 of an acre, figuring 1,392 man days spent on the job.

"The eradication of R. inerme-willow type in Meadow Valley was completed by the end of the season. Results of the work appear in table No. 5."

On parts of the Eldorado and Stanislaus operations, notably at the higher altitudinal range of sugar pine, clumps of extremely large R. cereum bushes were found. On such plants the ordinary grubbing methods were exceedingly costly, and auxiliary methods were tried out in order to cope more effectively with these special conditions. A block and tackle apparatus was tried out on the Eldorado with moderate success. The most effective method, developed late in the season in collaboration with the chemical investigations unit, was the application of Diesel oil to the decapitated crowns of this Ribes species. The Diesel oil applied to the scarified crown and roots causes their death and saves the laborious task of grubbing the plant out by the roots. This method, used very little in 1934, merits further experimentation and more extensive application. A factor worthy of mention here is the need for a supplementary chemical treatment embodying some very mobile type of apparatus that can readily be carried by regular eradication crews for applying chemicals to the crowns of the few deep-rooted Ribes plants, the eradication of which would require an excessive amount of hand labor and retard crew progress.

STANDARDS OF CONTROL

A. Relation of eradication costs to control.

The ultimate goal of Ribes eradication is the permanent extermination of all Ribes from control areas in order to permanently protect the sugar pine on such areas from damage by white pine blister rust. Many factors, however, bearing upon the ecology of Ribes operate to prevent complete and permanent Ribes suppression on all areas at one working. On some areas forest conditions are no longer favorable to Ribes growth and regeneration, and one thorough eradication job will result in their permanent suppression, while on the more favorable sites several eradications will be necessary in order to reach this goal. The control plan must consider the status of Ribes development on an area in order that the standards of work applied shall maintain a proper balance between costs (especially the initial working) and results accomplished. Results are largely measured by the permanency of the Ribes-free condition established, and working methods

"Burning of brush piles was successfully accomplished under the supervision of the Forest Service after the first fall rains. Since a lack of pitchy material in the piles made ignition difficult, a small application was found necessary.

"Significant figures on the number of acres worked per man day were difficult to obtain because it the first visit it type of ground cover which the area presented. Based on the area as a whole, three-tenths of an acre per man day was the coverage secured. The estimate of 35 acres of 100 percent willow-R. laevis crossection indicates a man-day capacity of about .06 of an acre, figuring 1,575 man days on the job.

"The eradication of R. inermo-willow type in Meadow Valley was completed by the end of the season. Results of new work appear in table No. 2.

On parts of the Tidoreo and Stanislaus operations, notably at the higher altitudinal range of brush plus, clumps of extremely large R. nevadense were found. On such plots the ordinary grubbing attack was especially costly, and auxiliary methods were tried out in order to make more effective with these special problems. A plan not tackle appropriate was tried out on the Tidoreo with moderate success. The more effective method, developed late in the season in collaboration with the Central Investigations unit, was the application of Diesel oil to the decapitated crowns of this Ribes species. The Diesel oil applied to the scarified crown and roots causes their death and saves the laborious task of grubbing the plant out by the roots. This method, used very little in 1934, merits further application and more extensive application. A factor worthy of mention here is the need for a supplementary chemical treatment sometimes even very small type of operation that can readily be carried by twelve eradication crews for applying chemicals to the crowns of the few deep-rooted Ribes plants, the eradication of which would require an excessive amount of hand labor and retard crew progress.

STANDARDS OF CONTROL

A. Relation of eradication costs to control.

The ultimate goal of Ribes eradication is the permanent extermination of all Ribes from central areas in order to permanently protect the sugar pine on such areas from damage by white pine blister rust. Many factors, however, bearing upon the ecology of Ribes operate to prevent complete and permanent Ribes suppression on all areas at any period. On most areas forest conditions are no longer favorable to Ribes growth and reproduction, and one through eradication job will result in small permanent suppression, while in the more favorable sites several applications will be necessary in order to reach this goal. The control plan must consider the status of Ribes development on an area in order that the standards of work applied shall maintain a proper balance between cost of the initial work and results accomplished. Results are largely measured by the permanency of the Ribes-free condition established, and varying degrees

which involve excessive searching for small bushes on areas favorable to continued Ribes development merely result in a cost out of proportion to the results obtained.

In setting up the efficiency standards that follow, it was first necessary to broadly recognize two general stages in the development of the Ribes flora, namely: (1) Ribes population that is on the increase, and (2) Ribes population that has passed the peak in its development and is either only holding its own in competition with other forest plants or is being suppressed by them.

(1) Ribes population on the increase.- Disturbances to forest and ground caused by logging and fire set up conditions favorable to Ribes growth, and the seeds of many seasons which have been stored in the duff soon germinate and produce new plants. Ribes seeds exhibit a remarkable ability to remain viable in the forest floor over long periods, and to germinate and form new bushes when environmental conditions are favorable. These bushes grow rapidly and fruit abundantly and new bushes continue to increase until the timber stand closes and curtails their development. Also along stream bottoms conditions for the growth, persistence and reproduction of Ribes are uniformly favorable. Under these conditions all Ribes might be removed one season and many new ones would appear within a few years. Several follow-up jobs are necessary and the objective of the initial eradication is to remove all large bushes in order to prevent the production of additional seeds.

(2) Ribes population on the decline.- On most virgin-timbered areas where the forest canopy is generally unbroken the competition of the cover type, accumulation of forest litter and changes in light and moisture incident thereto represent growing conditions unfavorable to Ribes. They are present because they originated before this unfavorable condition developed during the younger and more open stages of the ground cover. In such situations, they are only able to maintain their position in the stand and under some conditions are even slowly being suppressed. Bushes in this classification grow but slightly from year to year and bear but a scanty fruit crop, if any at all, in contrast with the fast-growing, prolific fruiting plants in logged areas. Practically no seedlings are produced under these conditions, and when a thorough initial eradication job is done the Ribes-free condition thus set up will continue over a long period.

B. Ribes live stem standard.

In order to attain an eradication cost consistent with the final objective of the work, the above facts were taken into account, and around them, and in accordance with pathological studies on blister-rust damage, the following Ribes-live-stem standards were evolved.

(1) For all areas on which the initial eradication represented the only general eradication necessary to establish a Ribes-free condition that will continue for an extended period (A, group (2)) Ribes

In setting up the efficiency standards that follow, it was first necessary to broadly recognize the general stages in the development of the Tibba flora, namely: (1) Tibbe population east by on the Estuary, and (2) Tibbe population that has passed the peak in its development and is either only holding its own in competition with Tibbe forest plants or is being suppressed by them.

(1) Tibbe population on the Tidewash.- Characteristic is large and young Tibbe by logging and fire set up conditions favorable to Tibbe growth, and the seeds of many species which have been spread in the soil soon germinate and produce new plants. Tibbe seeds exhibit a remarkable ability to remain viable in the forest floor over long periods, and to germinate and form Tibbe even environmental conditions are favorable. These Tibbe grow rapidly and first mountainly and have produce conditions to increase until the timber stand closes and prohibits their development. Also along stream Tibbe could then for the growth, penetrations and reproduction of Tibbe are materially favorable. Under these conditions all Tibbe might be removed one season and many one would expect within a few years. Several follow-up Tibbe are necessary and the objective of the marking regulation is to remove all large Tibbe in order to prevent the production of additional seeds.

(2) Tibbe population on Decline.- On more strip-flooded areas where the forest canopy is generally sufficient for occupation of the cover type, accumulation of forest litter and damage in light and moisture inhibit thereby increased ground vegetation and damage to trees. They are present because they originated before this unfavorable condition developed during the young and more open stages of the growth cycle. In most situations, they are only able to maintain their position in the stand under some conditions are even slowly losing ground. Damage in the classification grow but slightly from year to year and bear but a scanty fruit crop, if any at all, in contrast with the fast-growing, profits fruiting plants in logged areas. Practically no seedlings are produced under these conditions, and even a thorough initial eradication job is done the Tibbe-free condition this set up will continue over a long period.

B. Tibbe live stem standard.

In order to attain an eradication goal consistent with the final objective of the work, the above tests were taken into account, and among them, and in accordance with personal studies on Silver-cut Acreage, the following Tibbe-live-stem standards were evolved.

(1) For all areas on which the initial eradication operation marked the only general eradication necessary is adjusted a Stop-free condition that will continue for an extended period (A. prob. (2)) Tibbe

were reduced to an average of not to exceed 25 feet of live stem per acre. During 1934, stream type was also worked to the 25-ft. limit, although this type falls in classification A, group (1). In the application of this rule the checking maps were used to determine the distribution of missed bushes and any areas of 20 acres or over exceeding the 25-ft. limitation were reworked.

Under this classification occur all virgin-timbered areas, old logged areas in which the cover type again resembles that of the virgin forest and brush fields in which the predominating brush species is manzanita and/or chinquapin.

(2) For all areas obviously requiring more than one eradication, in order to secure a permanent Ribes-free condition, the 25-ft. rule was applied only to bushes containing 3 feet of live stem or more.

Under this classification occur most logged areas and burns, brush types in which the predominating brush species is neither manzanita nor chinquapin and all stream type. In such areas the plan of work was directed to the removal of all large bushes and as many of those containing less than three feet of live stem as were encountered without making a special effort to search for them. The checkers, in the course of their work, recorded all Ribes regardless of size but in determining the amount of rework necessary, only bushes measuring over three feet of live stem were computed.

C. Checking.

Checking may be defined as the systematic inspection of an area both preceding and following Ribes eradication for the purpose of recording the number of Ribes plants and amount of Ribes live stem on the control areas and the presenting of these data in such form as to be of most value to the control operation. It determines the thoroughness of the eradication job from which can be gauged the degree of protection given the sugar pine stand. The standard system of checking embodies the use of the strip method of sampling, the strip being divided into transects one chain long by 1/4 chain wide with the direction of the strip determined by compass and the distance by pacing. For the 1934 work, a minimum check of 4 percent in upland types and 10 percent for stream type was maintained.

Thirty specially trained checking men (an average of one to each 40 eradication men) were employed to handle the checking work, which this year was under the general supervision of the eradication operation supervisor on each forest. Direct supervision was vested in a head checker who, under general instructions from the operation supervisor, took charge of all checking on the forest.

The checking organization, in addition to performing the regular checking work which consumed 63 percent of their time, assisted in blocking out Ribes-free areas by running check strips in areas of low Ribes concentrations. During odd times when checking work was not pressing, the checkers

were at the disposal of the camp foreman to assist on eradication as needed. The following tabulations show the amount of time spent by the checkers on each activity and the cost of the regular checking work was determined from the number of man days spent on this activity.

TABLE NO. 2

CLASSIFICATION OF CHECKING TIME

Forest	Man Days on Checking	Man Days on Advance Checking	Man Days on Eradication	Total Man Days
Plumas	486	112	309	907
Eldorado	535	120	175	830
Stanislaus	665	113	166	944
Total	1,686	345	650	2,681

TABLE NO. 3

COSTS OF REGULAR CHECKING WORK

Forest	Acres Checked	Total Cost	Per Acre Cost
Plumas	35,458	$3,719.66	$.105
Eldorado	59,131	3,765.87	.064
Stanislaus	84,624	7,979.09	.094
Totals	179,213	$15,464.62	$.086

RESULTS OF WORK

Results of the season's work are summarized in tables Nos. 4 to 13 and the status of control work on each operation is shown on the progress maps of each forest immediately following the tables.

were at the disposal of the party forman to assist on evaluation as needed.
The following tabulations show the amount of time spent by the inspectors on each activity and the duty of the regular checking work, are determined from the number of man days spent on this activity.

TABLE NO. 2

CLASSIFICATION OF CHECKING TIME

Forest	Man Days on Checking	Man Days on Average Checking	Man Days on Travel-ation	Total Man Days
Plumas	456	116	309	907
Siskiyou	289	140	178	830
Klamath	251	171	106	528
Total	1,996	426	593	2,991

TABLE NO. 3

CLOSE OF SERVICE CHECKING WORK

Forest	Acres Checked	Total Cost	Per acre Cost
Plumas	34,452	$ 3,718.65	$.108
Siskiyou	20,141	2,139.87	.064
Klamath	24,...	1,319.00	.054
Totals	178,...	$1,...	$.060

RESULTS OF WORK

Results of the season's work are summarized in Table No. 4 in as far as the status of control work on each operation is shown on the progress maps of each forest immediately following the tables.

TABLE NO. 4

SUMMARY OF RIBES ERADICATION BY CONTROL UNITS, CALIFORNIA
1934

Class of Work	Control Unit	Acres Covered			Man Days			Total Ribes Eradicated	Total Cost	Per Acre	
		Worked by Crews	Blocked Out*	Total	Effective Man Days**	Non-effective Man Days***	Total			Ribes	Costs
NIRA	Plumas N. F.	38,445.1	7,697.0	46,142.1	20,532.5	7,268.5	27,801	4,889,049	$142,633.87	106.0	$3.09
	Eldorado N. F.	52,397.5	6,733.5	59,131.0	18,075.0	7,911.0	25,986	7,202,374	145,085.36	121.8	2.45
	Stanislaus N. F.	72,834.5	10,890.0	83,724.5	20,619.0	7,889.0	28,508	5,972,916	160,024.23	81.3	1.91
	Total	163,677.1	25,320.5	188,997.6	59,226.5	23,068.5	82,295	18,064,339	447,743.46	95.6	2.37
ECW	Stanislaus N. F.	960.0	-	960.0	271.0	-	271	28,213	486.15	29.4	-
	Yosemite N. P.	1,715.0	-	1,715.0	1,341.0	-	1,341	84,691	1,708.87	49.4	-
	Total	2,675.0	-	2,675.0	1,612.0	-	1,612	112,904	2,195.02	42.2	-
Grand Totals		166,352.1	25,320.5	191,672.6	60,838.5	23,068.5	83,907	18,177,243	$449,938.48	94.8	-

*Blocked-out areas are areas originally containing less than 25 feet of live stem per acre and therefore requiring no crew work.

**Includes both crew work and time consumed in blocking out areas.

***Includes all non-effective man days connected with the eradication project not included under effective man days. Non-effective man days includes the time of supervision (unit supervisors, camp foreman and straw bosses), checkers, field clerks, truck drivers, mechanics, cooks, flunkies and any other labor not actually engaged in grubbing Ribes. Effective man days includes the time of crewmen and crew leaders.

TABLE 32.4

SUMMARY OF BLISS INDICATORS BY OCCUPATIONAL CATEGORY

Test

Class of Work	Control Unit	Worked by Blacks		Worked by Whites		Mean Days Missed		Total Days Reported
		Crews	Ind.*	Crews	Ind.*	Active Non-strikers	Men Not Present**	
Firmness	N. E.	86,472.0	1,687.5	49,412.5	1,687.5	7,258.3	7,258.3	152,830.87
Intensive	N. E.	82,347.5	1,687.5	47,057.5	1,687.5	7,258.3	7,258.3	145,296.66
Steamlens	N. E.	73,884.5	1,687.5	42,220.0	1,687.5	7,258.3	7,258.3	134,196.09
Total	N. E.	242,704.0	5,062.5	138,690.0	5,062.5	21,774.9	21,774.9	432,323.62
Steamlens	N. E.	800.0	-	457.0	-	72.6	72.6	1,402.22
Total	N. E.	243,504.0	-	139,147.0	-	21,847.5	21,847.5	433,725.84
Overall Totals		486,208.0	5,062.5	277,837.0	5,062.5	43,622.4	43,622.4	866,049.46

*Although crews were mostly unmarried, less than 5% of them had children under age 18 living with them.

**Includes both crew work and time consumed in blocking out areas.

***Includes all non-active but duly commenced work days lost because of industrial accidents, sickness, death, etc. Non-active time data during the time of management (only) shutdowns, during which employees, in order to avoid layoffs, consented to work without pay (but with their medical and other benefits continued), is excluded. Inactive days during the time of a complete lockout are excluded.

TABLE NO. 6

SUMMARY OF RIBES ERADICATION BY TYPES - CALIFORNIA, 1934

Class of Work	Control Unit	Eradication Type	Acres Covered	Effective Man Days	Ribes Eradicated	Total Costs	Per Acre Basis		
							Man Days	Ribes	Costs
NIRA	Plumas N. F.	Timber	35,933.6	14,351.3	3,476,665	$99,694.36	.399	96.8	$2.77
		Cut Over	8,466.6	3,401.1	1,035,655	23,626.68	.402	122.3	2.79
		Brush	62.0	26.0	5,688	180.63	.419	91.7	2.91
		R.inerme slash	396.5	1,392.0	-	9,669.87	3.510	-	24.39
		Stream	1,283.4	1,362.1	371,041	9,462.33	1.061	289.1	7.37
		Total	46,142.1	20,532.5	4,889,049	142,633.87	.445	106.0	3.09
	Eldorado N. F.	Timber	55,268.5	16,326.6	6,521,715	131,052.31	.295	118.0	2.37
		Cut over	438.0	119.5	81,344	959.22	.273	185.7	2.19
		Brush	938.9	207.0	55,123	1,661.57	.220	58.7	1.77
		Stream	2,485.6	1,421.8	544,192	11,412.26	.572	218.9	4.59
		Total	59,131.0	18,074.9	7,202,374	145,085.36	.306	121.8	2.45
	Stanislaus N. F.	Timber	77,551.5	16,968.4	4,900,387	131,691.70	.218	63.2	1.70
		Cut Over	2,114.9	1,645.1	559,798	12,767.83	.778	264.7	6.04
		Brush	1,472.3	926.8	170,379	7,192.52	.629	115.7	4.88
		Stream	2,585.8	1,078.8	342,352	8,372.18	.417	132.4	3.24
		Total	83,724.5	20,619.1	5,972,916	160,024.23	.246	71.3	1.91
	Total NIRA	Timber	168,753.6	47,646.3	14,898,767	362,438.37	.282	88.3	2.15
		Cut Over	11,019.5	5,165.7	1,676,797	37,353.73	.469	152.2	3.39
		Brush	2,473.2	1,159.8	231,190	9,034.72	.469	93.5	3.65
		R.inerme slash	396.5	1,392.0	-	9,669.87	3.510	-	24.39
		Stream	6,354.8	3,862.7	1,257,585	29,246.77	.608	197.9	4.60
		Total	188,997.6	59,226.5	18,064,339	$447,743.46	.313	95.6	$2.37
ECW	Stanislaus N. F.	Timber	920.0	245.0	24,080	439.30	.266	26.2	-
		Stream	40.0	26.3	4,133	46.85	.656	103.3	-
		Total	960.0	271.3	28,213	486.15	.283	29.4	-
	Yosemite N.P.	Timber	1,715.0	1,340.7	84,691	1,708.87	.782	49.4	-
	Total ECW	Timber	2,635.0	1,585.7	108,771	2,148.17	.602	41.3	-
		Stream	40.0	26.3	4,133	46.85	.656	103.3	-
		Total	2,675.0	1,612.0	112,904	$2,195.02	.603	42.2	-
NIRA and ECW	Grand Totals	Timber	171,388.6	49,232.0	15,007,538	394,586.54	.287	87.6	-
		Cut over	11,019.5	5,165.7	1,676,797	37,353.73	.469	152.2	-
		Brush	2,473.2	1,159.8	231,190	9,034.72	.469	93.5	-
		R.inerme slash	396.5	1,392.0	-	9,669.87	3.510	-	-
		Stream	6,394.8	3,889.0	1,261,718	29,293.62	.608	197.3	-
		Totals	191,672.6	60,838.5	18,177,243	$449,938.48	.317	94.8	-

TABLE NO. 9

SUMMARY OF STORE SALES ALLOCATION BY TYPES - CHAIN CONTROL LEVEL

Owner Work Control Unit	Transaction Type	Acres	Effective Per Acre	Actual	For Acre Basis
Plumbing & Heating	Cut Over				
	Burned				
	Underground Plant				
	Total				
Electrical	Storm				
	Timber				
	Cut Over				
	Burned				
	Total				
Steel Plate Work	Storm				
	Timber				
	Cut Over				
	Burned				
	Total				
Total Area					
Structural Steel	Storm				
	Timber				
	Cut Over				
	Burned				
	Total				
Plumbing & Heating	Storm				
	Timber				
	Cut Over				
	Burned				
	Total				
Total Area					
Total Area					

TABLE NO. 6

SUMMARY OF RIBES ERADICATION BY OWNERSHIP, CALIFORNIA

Class of Work	Control Unit	Ownership	Total Area Covered		Effective Man Days	Total Ribes Eradicated	Total Cost of Operation
			Acres	Percent Federal			
NIRA	Plumas N. F.	Federal	29,827.6	65.00	13,561.5	3,547,397	$94,208.17
		Private	16,314.5	35.00	6,971.0	1,341,652	48,425.70
		Total	46,142.1	100.00	20,532.5	4,889,049	$142,633.87
	Eldorado N. F.	Federal	31,256.0	52.86	9,826.9	3,818,835	78,879.42
		Private	27,875.0	47.14	8,248.0	3,383,539	66,205.94
		Total	59,131.0	100.00	18,074.9	7,202,374	$145,085.36
	Stanislaus N. F.	Federal	34,524.5	41.23	8,897.2	2,862,918	69,050.66
		Private	49,200.0	58.77	11,721.9	3,109,998	90,973.57
		Total	83,724.5	100.00	20,619.1	5,972,916	160,024.23
	Grand Totals	Federal	95,608.1	50.59	32,285.6	10,229,150	242,138.25
		Private	93,389.5	49.41	26,940.9	7,835,189	205,605.21
		Total	188,997.6	100.00	59,226.5	18,064,339	$447,743.46
ECW	Stanislaus N. F.	Federal	-	-	-	-	-
		Private	960.0	-	271.3	28,213	486.15
		Total	960.0	-	271.3	28,213	$486.15
	Yosemite N. P.	Federal	1,715.0	100.00	1,340.7	84,691	1,708.87
		Private	-	-	-	-	-
		Total	1,715.0	100.00	1,340.7	84,691	$1,708.87
	Grand Totals	Federal	1,715.0	64.11	1,340.7	84,691	1,708.87
		Private	960.0	35.89	271.3	28,213	486.15
		Total	2,675.0	100.00	1,612.0	112,904	* 2,195.02
NIRA and ECW	Grand Totals	Federal	97,323.1	50.78	33,626.3	10,313,841	243,847.12
		Private	94,349.5	49.22	27,212.2	7,863,402	206,091.36
		Total	191,672.6	100.00	60,838.5	18,177,243	$449,938.48

*Costs of the ECW operation include only the expenditures of the Bureau of Entomology and Plant Quarantine for technical supervision of the work.

TABLE NO. 6

SUMMARY OF MICRO RADIOGRAPHS BY OPERATORS, CALENDAR

Class of Work	Control Unit	Operator	Total Area Covered: Patches	Total Area Covered: Sq. Ft.	Effective Time Man Days	Total Micro-Radiographs	Total Over-all Operation
NDTA	Planned	Federal	65.00	13,561.5	3,547,357		294,208.17
		Private	35.00	6,971.0	1,611,452		[illegible]
		Total	[illegible]	[illegible]	[illegible]		[illegible]
	Unplanned	Federal	06.25	1,346.0	3,315,935		78,279.42
		Private	47.75	1,245.0	3,383,259		[illegible]
		Total	[illegible]	[illegible]	[illegible]		[illegible]
	Emergency	Federal	[illegible]	[illegible]	[illegible]		[illegible]
		Private	[illegible]	[illegible]	[illegible]		[illegible]
		Total	[illegible]	[illegible]	[illegible]		[illegible]
	Grand Totals	Federal	80,606.1	[illegible]	[illegible]		[illegible]
		Private	49.91	86,940.9	7,386,129		[illegible]
		Total	100.00	32,286.5	[illegible]		[illegible]
NDT	Steam-Iron Foundry	Federal	-	-	-	-	-
		Private	960.0	-	271.4	98,305	646.75
		Total	960.0	-	271.4	98,305	646.75
	Joseniye	Federal	1,715.0	100.00	1,363.7	84,021	1,708.87
		Private	-	-	-	-	-
		Total	1,715.0	100.00	1,363.7	84,021	81,708.87
	Grand Totals	Federal	1,715.0	96.71	1,360.7	84,321	1,708.87
		Private	2715.0	36.29	271.3	98,315	486.75
		Total	5,675.0	100.00	1,635.0	112,304	* 3,195.62
All Class and Grand Totals		Federal	97,323.1	50.71	25,636.3	10,111,961	243,647.32
		Private	94,843.6	49.24	47,124.3	7,108,462	2,441.20
		Total	191,976.6	100.00	80,880.0	26,177,276	246,088.52

*Costs of the NDT operation include only the personnel leave of Mr. Burnes of Technology and Plans Operations for technical supervision of the work.

TABLE NO. 7

TOTAL NUMBER OF RIBES ERADICATED BY SPECIES, CALIFORNIA

Control Unit	Eradication Type	R. roezli		R. nevadense		R. cereum		R. viscosissimum		R. inerme		Total Bushes
		Bushes	Percent of Total	Bushes	Percent of Total	Bushes	Percent of Total	Bushes	Percent of Total	Bushes	Percent of Total	
Plumas N. F.	Timber	2,593,974	74.61	603,961	17.37	-	-	275,594	7.93	3,136	.09	3,476,665
	Cut over	865,840	83.60	160,288	15.48	-	-	10	-	9,517	.92	1,035,655
	Brush	4,613	81.10	1,075	18.90	-	-	-	-	-	-	5,688
	Stream	124,780	33.63	206,595	55.68	-	-	2,085	0.56	37,581	10.13	371,041
	Total	3,589,207	73.41	971,919	19.88	-	-	277,689	5.68	50,234	1.03	4,889,049
Eldorado N. F.	Timber	6,005,763	92.09	173,607	2.66	186,862	2.87	155,483	2.38	-	-	6,521,715
	Cut over	81,218	99.85	83	0.10	43	0.05	-	-	-	-	81,344
	Brush	48,567	88.11	408	0.74	6,148	11.15	-	-	-	-	55,123
	Stream	372,296	68.41	155,737	28.62	12,210	2.24	3,949	0.73	-	-	544,192
	Total	6,507,844	90.36	329,835	4.58	205,263	2.85	159,432	2.21	-	-	7,202,374
Stanislaus N. F.	Timber	4,458,663	90.54	189,557	3.85	207,279	4.21	68,968	1.40	-	-	4,924,467
	Cut over	555,830	99.29	3,968	0.71	-	-	-	-	-	-	559,798
	Brush	169,056	99.22	1,023	0.60	277	0.16	23	0.02	-	-	170,379
	Stream	233,409	67.36	110,925	32.01	1,028	0.30	1,123	0.33	-	-	346,485
	Total	5,416,958	90.27	305,473	5.09	208,584	3.48	70,114	1.16	-	-	6,001,129
Yosemite N. F.	Timber	75,565	89.2	9,126	10.8	-	-	-	-	-	-	84,691
Grand Totals	Timber	13,133,965	87.52	976,251	6.50	394,141	2.63	500,045	3.33	3,136	.02	15,007,538
	Cut over	1,502,888	89.63	164,339	9.80	43	-	10	-	9,517	.57	1,676,797
	Brush	222,236	96.13	2,506	1.08	6,425	2.78	23	.01	-	-	231,190
	Stream	730,485	57.90	473,257	37.51	13,238	1.05	7,157	.57	37,581	2.97	1,261,718
	Total	15,589,574	85.76	1,616,353	8.89	413,847	2.28	507,235	2.79	50,234	.28	18,177,243

TABLE 5.2.1

TOTAL MONTHLY IN BOUND AND OUTBOUND TRAFFIC BY SERVICE CATEGORIES

Geographical Unit	Month	Inbound Traffic						Outbound Traffic					
		Telephone		Telex		Data		Telephone		Telex		Data	
		Number of Calls	Duration of Calls	Number of Calls	Duration of Calls	Number of Calls	Duration of Calls	Number of Calls	Duration of Calls	Number of Calls	Duration of Calls	Number of Calls	Duration of Calls
Total	January	3,889,274	12,284,750	28,693	89,035	17,027	58,695	3,889,274	12,284,750	28,693	89,035	17,027	58,695
	February	3,889,274	12,284,750	28,693	89,035	17,027	58,695	3,889,274	12,284,750	28,693	89,035	17,027	58,695
	March	3,889,274	12,284,750	28,693	89,035	17,027	58,695	3,889,274	12,284,750	28,693	89,035	17,027	58,695
	April	3,889,274	12,284,750	28,693	89,035	17,027	58,695	3,889,274	12,284,750	28,693	89,035	17,027	58,695
	May	3,889,274	12,284,750	28,693	89,035	17,027	58,695	3,889,274	12,284,750	28,693	89,035	17,027	58,695
	June	3,889,274	12,284,750	28,693	89,035	17,027	58,695	3,889,274	12,284,750	28,693	89,035	17,027	58,695
	July	3,889,274	12,284,750	28,693	89,035	17,027	58,695	3,889,274	12,284,750	28,693	89,035	17,027	58,695
	August	3,889,274	12,284,750	28,693	89,035	17,027	58,695	3,889,274	12,284,750	28,693	89,035	17,027	58,695
	September	3,889,274	12,284,750	28,693	89,035	17,027	58,695	3,889,274	12,284,750	28,693	89,035	17,027	58,695
	October	3,889,274	12,284,750	28,693	89,035	17,027	58,695	3,889,274	12,284,750	28,693	89,035	17,027	58,695
	November	3,889,274	12,284,750	28,693	89,035	17,027	58,695	3,889,274	12,284,750	28,693	89,035	17,027	58,695
	December	3,889,274	12,284,750	28,693	89,035	17,027	58,695	3,889,274	12,284,750	28,693	89,035	17,027	58,695
Total		46,671,288	147,417,000	344,316	1,068,420	204,324	704,340	46,671,288	147,417,000	344,316	1,068,420	204,324	704,340
Domestic	January	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
	February	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
	March	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
	April	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
	May	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
	June	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
	July	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
	August	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
	September	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
	October	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
	November	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
	December	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
Total		15,557,096	49,139,000	114,772	356,140	68,108	234,780	15,557,096	49,139,000	114,772	356,140	68,108	234,780
Intra-Region	January	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
	February	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
	March	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
	April	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
	May	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
	June	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
	July	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
	August	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
	September	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
	October	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
	November	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
	December	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
Total		23,335,644	73,708,500	172,158	534,210	102,162	352,170	23,335,644	73,708,500	172,158	534,210	102,162	352,170
Inter-Region	January	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	February	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	March	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	April	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	May	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	June	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	July	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	August	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	September	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	October	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	November	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	December	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
Total		7,778,548	24,569,500	57,386	178,070	34,054	117,390	7,778,548	24,569,500	57,386	178,070	34,054	117,390
Overseas	January	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	February	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	March	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	April	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	May	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	June	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	July	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	August	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	September	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	October	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	November	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	December	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
Total		7,778,548	24,569,500	57,386	178,070	34,054	117,390	7,778,548	24,569,500	57,386	178,070	34,054	117,390
Domestic	January	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
	February	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
	March	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
	April	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
	May	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
	June	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
	July	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
	August	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
	September	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
	October	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
	November	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
	December	1,296,425	4,094,917	9,564	29,678	5,676	19,565	1,296,425	4,094,917	9,564	29,678	5,676	19,565
Total		15,557,096	49,139,000	114,772	356,140	68,108	234,780	15,557,096	49,139,000	114,772	356,140	68,108	234,780
Intra-Region	January	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
	February	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
	March	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
	April	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
	May	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
	June	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
	July	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
	August	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
	September	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
	October	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
	November	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
	December	1,944,637	6,142,375	14,346	44,517	8,514	29,347	1,944,637	6,142,375	14,346	44,517	8,514	29,347
Total		23,335,644	73,708,500	172,158	534,210	102,162	352,170	23,335,644	73,708,500	172,158	534,210	102,162	352,170
Inter-Region	January	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	February	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	March	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	April	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	May	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	June	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	July	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	August	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	September	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	October	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	November	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	December	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
Total		7,778,548	24,569,500	57,386	178,070	34,054	117,390	7,778,548	24,569,500	57,386	178,070	34,054	117,390
Overseas	January	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	February	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	March	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	April	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	May	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	June	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	July	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	August	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	September	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	October	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	November	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
	December	648,212	2,047,458	4,782	14,839	2,838	9,782	648,212	2,047,458	4,782	14,839	2,838	9,782
Total		7,778,548	24,569,500	57,386	178,070	34,054	117,390	7,778,548	24,569,500	57,386	178,070	34,054	117,390

TABLE NO. 8

REERADICATION RESULTS, MEADOW VALLEY, PLUMAS NATIONAL FOREST

Types	Man Days	Acres	Ribes Eradicated		Per Acre Basis		
			Bushes	F.L.S.	Ribes	Live Stem	Man Days
Timber	239.8	1,519	25,699	157,797	17	104	.12
Cut over	140.4	118	8,111	51,577	69	437	1.12
Stream	115.3	259	10,141	123,828	39	478	.50
Totals	495.5	1,896	43,951	333,202	23	176	.25

The original work on this area was done in 1929. The data in table No. 8 are included in the regular eradication totals for the Plumas operation and are separated here to show Ribes conditions on the area five years after the initial working. The original Ribes removed from this area averaged 142 per acre compared to the present average of 23 per acre, with the man days per acre falling from 0.51 to 0.25.

TABLE NO. 8

TABLE NO. 9

SUMMARY OF FINAL CHECKING RESULTS

Class of Work	Control Unit	Eradication Types	Areas Worked By Crews	Areas Checked	Percent of Check	Man Days on Checking	Per Acre Results		Areas Blocked Out by Advance Check			
							Missed Bushes	Missed F.L.S.*	Areas Blocked Out	Man Days	Per Acre Results Bushes	Per Acre Results F.L.S.*
NIRA	Plumas N. F.	Timber	29,595.6	1,161.1	4.2	265.0	2.2	8.9	6,338	98.0	0.4	4.1
		Cut over	7,194.6	285.8	4.4	60.5	1.9	10.1	1,272	14.0	0.7	2.5
		Brush	62.0	2.2	3.5	1.0	-	-	-	-	-	-
		R.inerme slash	396.5	12.1	3.8	2.7	4.0	7.4	-	-	-	-
		Stream	1,196.4	148.5	14.1	46.8	4.3	12.0	87	-	-	-
		Total	38,445.1	1,609.7	4.5	378.0	2.4	9.4	7,697	112.0	0.5	3.7
	Eldorado N. F.	Timber	49,419.5	2,212.9	4.78	412.5	3.0	8.7	5,849.0	73.7	.30	1.3
		Cut over	248.0	11.7	4.70	4.5	7.2	20.1	190.0	2.5	.65	1.8
		Brush	244.4	10.5	4.32	2.0	3.8	10.8	694.5	15.3	.50	4.4
		Stream	2,485.6	363.4	14.62	116.0	6.2	8.3	-	-	-	-
		Total	52,397.5	2,598.5	4.96	535.0	3.5	8.7	6,733.5	91.5	.33	1.63
	Stanislaus N. F.	Timber	66,800.5	2,660.1	3.98	587.0	2.6	8.6	10,751.0	109.0	0.3	2.2
		Cut over	2,114.9	96.8	4.58	26.0	3.4	24.4	-	-	-	-
		Brush	1,333.3	51.8	3.89	43.0	3.1	11.6	139.0	4.0	0.8	4.5
		Stream	2,585.8	402.9	15.58	123.0	3.9	9.4	-	-	-	-
		Total	72,834.5	3,211.6	4.4	759.0	2.8	9.2	10,890.0	113.0	0.3	2.2
ECW	Stanislaus N. F.	Timber	920.0	43.0	4.67	10.0	1.9	7.0	-	-	-	-
		Stream	40.0	5.6	14.0	2.0	3.4	12.2	-	-	-	-
		Total	960.0	48.6	5.06	12.0	2.1	7.6	-	-	-	-
	Yosemite N. F.	Timber	1,715.0	72.3	4.2	27.0	2.3	9.7	-	-	-	-

*F.L.S. refers to feet of Ribes live stem.

TABLE IV.3

SUMMARY OF ANNUAL CROPPING SCHEME

Class of Work	Control Unit	Irrigation Scheme	Area Served By Canal	Net Area Cultivated	Per- cent of	Net Area Irrigated	Per Acre Benefits Based on Net Area		Per Acre Benefits Based on Gross Area	
							Net Area Irrigated	Gross Area Irrigated	Net Area Irrigated	Gross Area Irrigated

Expenditures

Expenditures and costs of the 1934 field work are itemized in tables Nos. 10 and 11. Table No. 10 shows the classified expenditures both for the joint fund disbursed by the Forest Service and the Bureau fund disbursed by the Bureau of Entomology and Plant Quarantine, whereas in table No. 11 are shown the credit and debit adjustments to expenditures for the purpose of affixing a fair cost to the field operation.

In making these adjustments an arbitrary depreciation charge of one-third the value of equipment and trucks was figured as an appropriate charge against the 1934 operation. Accordingly two-thirds of the cost of all equipment purchased, as well as the value of supplies purchased but not used in 1934, was deducted from the 1934 expenditures. Such supplies include non-perishable groceries and twine available for use in 1935. The cost of maintaining the Oakland Blister Rust office, which includes the salaries of one clerk and one stenographer, rental of quarters, furniture and adding machines, as well as miscellaneous supply items, was not computed against the cost of the field job. In arriving at the final operation cost, it was necessary to include with the 1934 net expenditures one-third of the value of equipment purchased in 1932 and 1933.

TABLE NO. 10

CLASSIFIED EXPENDITURES
NIRA OPERATIONS

Part A - Joint Blister Rust Fund Disbursed by Forest Service

Item	Plumas	Eldorado	Stanislaus	Total
Salaries, permanent men	$1,590.02	$1,055.34	$925.12	$3,570.48
Wages, temporary men	100,079.68	101,667.35	109,631.52	311,378.55
Subsistence supplies	17,716.79	22,522.25	25,672.28	65,911.32
Services and other supplies	4,035.04	3,928.79	2,828.45	10,792.28
Equipment	13,945.99	12,795.99	5,437.11	32,179.09
Trucks	4,198.34	3,491.84	1,443.54	9,133.72
Transportation and travel	4,323.43	2,427.83	3,826.84	10,578.10
Totals	$145,889.29	$147,889.39	$149,764.86	$443,543.54

Part B - Blister Rust Fund Disbursed by Bureau of Entomology and Plant Quarantine

Item	Plumas	Eldorado	Stanislaus	Total
Salaries, permanent men	$7,846.62	$6,923.28	$8,395.78	$23,165.68
Wages, temporary men	384.20	192.50	935.55	1,512.25
Subsistence supplies	-	-	-	-
Services and other supplies	455.34	425.36	974.45	1,855.15
Equipment	31.69	.39	628.90	660.98
Trucks	1,462.02	487.34	974.68	2,924.04
Transportation and travel	1,758.65	1,080.77	1,901.42	4,740.84
Totals	$11,938.52	$9,109.64	$13,810.78	$34,858.94
Totals Both Funds	$157,827.81	$156,999.03	$163,575.64	$478,402.48

Expenditures and costs of the 1934 field work are itemized in tables Nos. 10 and 11. Table No. 12 shows the [illegible] for the joint road constructed by the Forest Service and the Bureau from [illegible] Ranger of Lakeview Ranger Station, whereas it table No. 11 are shown the credit and debit adjustments to expenditures for the purpose of affixing a fair cost to the field operation.

In making these adjustments an arbitrary depreciation charge of one-third the value of equipment and trucks was figured as an appropriate charge against the 1934 operation. Accordingly one-third of the cost of six equipment purchased, as well as the value of supplies purchased but not used in 1934, was deducted from the 1934 expenditures. Some supplies remain unperishable crosscut saw value available for use in 1935. The work of maintaining the Deschutes Ridge fire office, which includes the salaries of one clerk and one stenographer, rental of premises, furniture and heating equipment, as well as miscellaneous supply items, was not considered equally [illegible] the field job. In arriving at the final operation cost, it was necessary to include with the 1934 net operations one-third of the value of equipment purchased in 1932 and 1933.

TABLE NO. 10

[illegible]
[illegible]

Part 1 - Joint Bidder Work Done Supervised by Forest Service

Item	Planned	Performed	Total
Salaries, permanent men	$1,800.00	$1,800.34	$3,600.34
Labor, temporary men	700.00	701.09	1,401.09
Supplies and Supplies	17,716.19	17,716.19	35,432.38
Services and other supplies	1,000.00	1,000.00	2,000.00
Insurance	10,000.00	10,000.00	20,000.00
Transportation	1,150.00	1,150.00	2,300.00
Expenditures and travel	1,000.00	1,000.00	2,000.00
Totals	$33,366.19	$33,367.62	$66,733.81

Part 2 - Bidder Work Done Supervised by Bureau of Forestry and Final Computation

Item	Planned	Performed	Total
Salaries, permanent men	$1,800.00	$1,800.34	$3,600.34
Labor, temporary men	700.00	701.09	1,401.09
Supplies and Supplies	17,716.19	17,716.19	35,432.38
Services and other supplies	1,000.00	1,000.00	2,000.00
Insurance	10,000.00	10,000.00	20,000.00
Transportation	1,150.00	1,150.00	2,300.00
Expenditures and travel	1,000.00	1,000.00	2,000.00
Totals	$33,366.19	$33,367.62	$66,733.81

TABLE NO. 11

COST OF 1934 EMERGENCY RELIEF ADMINISTRATION OPERATIONS

	Item	Plumas	Eldorado	Stanislaus	Totals
	Total 1934 expenditures	$157,827.81	$156,999.03	$163,575.64	$478,402.48
Credits	2/3 cost 1934 equipment & trucks	13,092.03	11,183.71	5,236.88	29,512.62
Credits	Supplies on hand	421.32	406.29	650.42	1,478.03
Credits	Maintenance Oakland Ofc. and other expenditures not chargeable to field operations	2,065.20	1,185.23	1,028.25	4,278.68
Credits	Total credits	$15,578.55	$12,775.23	$ 6,915.55	$35,269.33
	Net 1934 operation expenditures	142,249.26	144,223.80	156,660.09	443,133.15
Debit	1/3 cost 1932 and 1933 equipment	384.61	861.56	3,364.14	4,610.31
	Net cost of 1934 operation	$142,633.87	$145,085.36	$160,024.23	$447,743.46
	Cost of effective man day	$6.9467	$8.0270	$7.7610	$7.5599

TABLE NO. 12

MEAL COSTS

Item	Plumas	Eldorado	Stanislaus	Totals
Food	$17,716.79	$22,522.35	$25,272.28	$65,511.32
Kitchen help	9,723.77	15,109.00	17,289.13	42,121.90
Transportation	1,452.94	3,114.28	3,655.48	8,222.70
Totals	$28,893.50	$40,745.53	$46,216.89	$115,855.92
Amount paid for meals by men	$23,334.25	$19,498.50	$23,393.00	$66,225.75
Deficit	$5,559.25	$21,247.03	$22,823.89	$49,630.17
Total meals served	93,337	83,787	103,452	280,576
Average cost per meal	$0.310	$0.486	$0.446	$0.413
Average deficit per meal	$.060	$.236	$.196	$.163

TABLE NO. 11

COST OF 1954 MINE OPERATIONS

	Item	Pioneer	Silverado	Treasure	Total
	Total 1954 expenditures	$187,827.81	$[illegible],[illegible].[illegible]	$[illegible],[illegible].[illegible]	$[illegible],[illegible].[illegible]
Charges	3/3 cost 1954 equipment trucks	13,082.09	11,183.71	[illegible],[illegible].[illegible]	[illegible],[illegible].[illegible]
	Supplies on hand	[illegible].89	[illegible].29	[illegible].[illegible]	[illegible].[illegible]
	Maintenance Oakland Ofc. and other expenditures not chargeable to field operations	[illegible],[illegible].[illegible]	[illegible],[illegible].[illegible]	[illegible],[illegible].[illegible]	[illegible],[illegible].[illegible]
	Total credits	$[illegible],[illegible].[illegible]	$[illegible],[illegible].[illegible]	$[illegible],[illegible].[illegible]	$[illegible],[illegible].[illegible]
	Net 1954 operation expenditures	[illegible],[illegible].[illegible]	[illegible],[illegible].[illegible]	[illegible],[illegible].[illegible]	[illegible],[illegible].[illegible]
Credits	1/3 cost 1952 and 1950 equipment	[illegible].[illegible]	[illegible].[illegible]	[illegible],[illegible].[illegible]	[illegible],[illegible].[illegible]
	Net cost of 1954 operation	$[illegible],[illegible].[illegible]	$[illegible],[illegible].[illegible]	$[illegible],[illegible].[illegible]	$[illegible],[illegible].[illegible]
	Cost of effective man day	$[illegible].[illegible]	$[illegible].[illegible]	$[illegible].[illegible]	$[illegible].[illegible]

TABLE NO. 12

MESS COSTS

Item	Pioneer	Silverado	Treasure	Total
Food	$17,[illegible].[illegible]	$[illegible],[illegible].[illegible]	$[illegible],[illegible].[illegible]	$[illegible],[illegible].[illegible]
Kitchen help	[illegible],[illegible].[illegible]	[illegible],[illegible].00	[illegible],[illegible].[illegible]	$[illegible],[illegible].[illegible]
Transportation	[illegible],[illegible].[illegible]	[illegible],[illegible].[illegible]	[illegible],[illegible].[illegible]	$[illegible],[illegible].[illegible]
Totals	$[illegible],[illegible].[illegible]	$[illegible],[illegible].[illegible]	$[illegible],[illegible].[illegible]	$[illegible],[illegible].[illegible]
Amount paid for meals by men	$[illegible],[illegible].[illegible]	$[illegible],[illegible].00	$[illegible],[illegible].[illegible]	$[illegible],[illegible].[illegible]
Deficit	$[illegible],[illegible].[illegible]	$[illegible],[illegible].[illegible]	$[illegible],[illegible].[illegible]	$[illegible],[illegible].[illegible]
Total meals served	93,337	83,767	103,432	280,536
Average cost per meal	$0.310	$0.436	$0.446	$0.[illegible]
Average daily attendance	[illegible].[illegible]	[illegible].[illegible]	[illegible].[illegible]	[illegible].[illegible]

TABLE NO. 13

EXPENDITURES ON ECW WORK

(Disbursed by Bureau of Entomology and Plant Quarantine)

Item	Stanislaus	Yosemite	Total
Salaries, permanent men	$306.98	$1,072.34	$1,379.32
Wages, temporary men	-	443.62	443.62
Subsistence supplies	-	-	-
Services and other supplies	-	5.00	5.00
Equipment and trucks	-	-	-
Transportation and travel	179.17	187.91	367.08
Totals	$486.15	$1,708.87	$2,195.02

TABLE NO. 12

EXPENDITURES ON NEW WORK

[illegible] by Bureau of Engineering and Plant Operations]

Item	Electrical	Technical	Total
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

CONTROL RECONNAISSANCE, CALIFORNIA
1934

By
F. A. Patty
Associate Pathologist

INTRODUCTION

Control reconnaissance was performed on the Sierra, Eldorado, and Stanislaus National Forests and Yosemite National Park in 1934. All of the sugar pine type on the Sierra National Forest and Yosemite National Park has been mapped. However, there are two and one-half townships on the Eldorado and four and one-half townships on the Stanislaus National Forest yet to be completed.

DESCRIPTION OF AREAS

The area in Yosemite National Park lies south of the Merced River and extends to the boundary of the Sierra National Forest. It is drained chiefly by the Merced and the South Fork of the Merced River. The topography is generally steep with cliffs and barren granite slopes. Approximately half of the area has been logged and the remainder supports an excellent stand of virgin sugar pine.

The Sierra National Forest is bordered on the north by the Stanislaus National Forest and Yosemite National Park and on the south by the Sequoia National Forest. The North and Middle Forks of King's River, the San Joaquin River and the South Fork of the Merced River form the chief drainages. Most of the sugar pine type lies between the North Fork of the King's River and the South Fork of the Merced River. Except in the vicinity of the big rivers, the topography is not generally precipitous. About two-thirds of the sugar pine type has been cut over and much of this logged land now supports dense concentrations of brush and Ribes. The sugar pine in the virgin stands is generally of excellent quality.

The Eldorado and the Stanislaus National Forest areas have been described in previous reconnaissance reports.

PERSONNEL

One party of three men was assigned to the Eldorado, two men to the Stanislaus, and six men to the Sierra National Forest. A 5-man party worked in Yosemite National Park and on the north end of the Sierra National Forest. In addition, three Civilian Conservation Corps foresters were assigned to reconnaissance by the Park Service in Yosemite National Park for a period of six weeks. During October, ten men from the permanent personnel of the Oakland Blister Rust office spent about two weeks on reconnaissance on the Sierra National Forest.

CALAVERAS AND TUOLUMNE COUNTIES, CALIFORNIA

1954

By

F. A. Petty

Associate Petrologist

INTRODUCTION

Detail reconnaissance was performed on the Sierra, Stanislaus and Tuolumne National Forests and Yosemite National Park in 1954. All of the sugar pine type on the Sierra National Forest and Yosemite National Park has been mapped. However, there are two and one-half townships on the Stanislaus and four and one-half townships on the Tuolumne National Forest yet to be completed.

DESCRIPTION OF AREAS

The area in Yosemite National Park lies south of the Merced River and extends to the boundary of the Sierra National Forest. It is bounded chiefly by the Merced and the South Fork of the Tuolumne River. The topography is generally steep with cliffs and barren peaks to alpine. Approximately half of the area has logged and the remainder supports an excellent stand of virgin sugar pine.

The Sierra National Forest is bordered on the north by the Stanislaus National Forest and Yosemite National Park and on the east by the Sequoia National Forest. The North and Middle Forks of Kings River, the San Joaquin River and the South Fork of the Merced River flow the area dissected. Most of the sugar pine type lies between the South Fork of Kings River and the South Fork of the Merced River. Except in the vicinity of the Big Trees, the topography is not generally prohibitive. About two-thirds of the sugar pine type has been cut over and much of this logged land now supports dense second-growth of young timber. The sugar pine in the virgin stands is generally of excellent quality.

The Mildorado and the Stanislaus National Forest areas have been described in previous reconnaissance reports.

PERSONNEL

One party of three men was assigned to the Mildorado, two men to the Stanislaus, and six men to the Sierra National Forest. A three party worked in Yosemite National Park and on the north end of the Sierra National Forest. In addition, three Civilian Conservation Corps foresters were assigned to reconnaissance by the Park Service in Yosemite National Park for a period of six weeks. During October, two men from the personnel previously of the Oakland Disaster Road office spent about two weeks on reconnaissance on the Sierra National Forest.

METHODS OF WORK

The methods used in recording the data during 1934 differ from those of previous years. A detailed description of these new methods, taken from the reconnaissance manual, follows:

(Instructions for Performing Control Reconnaissance)

I. Purpose.

The purpose of control reconnaissance is to make a rapid and systematic survey of the sugar pine regions to determine (1) the extent and distribution of sugar pine types, and (2) the factors influencing the costs and methods of eradicating Ribes thereon.

II. Methods.

A. Surveyed country:

The basis for performing reconnaissance on surveyed country is the section which the reconnaissance man works alone. Four strips are run in a cardinal direction through the section, in the course of which the timber type and ground cover boundaries are determined. In addition, the Ribes data are recorded on a continuous strip 1/4 chain wide and timber data for sugar pine are recorded on 32 circular plots each 37 feet in radius (1/10 acre).

1. Typing.- The scale of the field map on which the different types are sketched is four inches to the mile. There will be two types of maps to make, one for timber and one for ground cover.

(a) Timber type map. Any stand in which sugar pine is the key tree forming approximately 20 percent or more of the stand by volume is considered sugar pine type. A stand with less than 20 percent sugar pine by volume is classified as non-sugar pine type. A pure stand is one which contains approximately 80 percent or more by volume of a single species 8 inches D.B.H. and larger and a mixed stand is one containing two or more species neither of which comprises as much as 80 percent of the stand by volume, 8 inches D.B.H. and larger (or less than 20 percent). Ten acres is the minimum size for a separate timber type containing sugar pine or dense brush and forty acres for non-sugar pine types.

The following is a list of the more common timber types and type designations used in blister rust control reconnaissance. In general the types, symbols, and color legends correspond to the ones used by H. A. Jensen and A. E. Weislander in compiling the "California Vegetative Type Map"--

Examples of work

The methods used in recording the data during 1954 differ from those of previous years. A detailed description of these may be found from the reconnaissance manual, as follows:

(Instructions for Performing Control Reconnaissance)

I. Purpose.

The purpose of control reconnaissance is to make a rapid and systematic survey of the major pine regions in Jefferson [1] the extent and distribution of major pine types, and (2) the factors influencing the vigor and methods of eradicating bites thereon.

II. Methods.

A. Surveyed country:

1. Typing.- The scale of the field map on which the different types are sketched is four inches to the mile. There will be ten (10) plots to make, one for timber and one for ground cover.

(a) Timber type map. Any stand in which sugar pine is the only tree forming approximately 20 percent or more of the stand by volume is considered sugar pine type. A stand with less than 20 percent sugar pine by volume is classified as non-sugar pine type. A pine stand is one which contains approximately 80 percent or more by volume of a single species of timber 8.I.M. and larger and a mixed stand is one containing two or more species neither of which comprises as much as 80 percent of the stand by volume, 8 inches D.B.H. and larger (or less than 20 percent). The acre is the minimum size for a separable timber type containing sugar pine of mature growth and forty acres for non-sugar pine types.

The following is a list of the more common timber types and type designations used in Plumas Unit control reconnaissance. In general the types, symbols, and color legends correspond to the ones used by U. S. Forest Service and A. E. Palmer in compiling the California Timber Type Map.

Timber Types	Symbol
Sugar pine - Douglas fir	SD
Sugar pine - ponderosa pine	SY
" " - Jeffrey pine	SJ
" " - ponderosa pine-Douglas fir	SYd
" " - ponderosa pine-red fir	SYr
" " - " " white fir	SYw
" " - " " Shasta fir	SYs
" " - " " white fir-red fir	SYf
" " - " " Douglas fir-white fir	SYdw
" " - " " " " red fir	SYdr
" " - " " " " white fir-red fir	SYdf
" " - Douglas fir-white fir	SDw
" " - " " -red fir	SDr
" " - " " -white fir-red fir	SDf
" " - white fir	SFw
" " - red fir	SFr
" " - Shasta fir	SFs
" " - white fir-red fir	SF
Barren	Ba
Cultivated	Cu
Brush	Br
Meadow or Grassland	Md
Lodgepole pine	L

Cut-over types are designated by the addition of CO to the type symbol (as SYd CO) and the circumscription of all cut-over areas with this symbol: . . . . . The color legend is the same as that for non-cut-over types.

For Jeffrey pine types, substitute "J" for "Y" in the above symbols: the color legend is the same as that for ponderosa pine.

Cedar is not considered in any of the types.

To denote the presence of Big Tree (Sequoia washingtoniana), use the appropriate timber type disregarding the Big Trees and outline the areas containing Big Trees with a broken red line (- - - - -) and designate by the symbol "Bt."

If the color legend for non-sugar pine trees is desired, use the same legend given above disregarding the presence of sugar pine. Symbols for non-sugar pine types are obtained by removing the prefix "S" from the symbols for sugar pine types.

B. Ground cover types:

There are seven types which will be sketched on the ground cover map,

Timber Types	Symbol
Sugar pine - Douglas fir	SP
Sugar pine - ponderosa pine	PT
" " - white fir	WF
" " - ponderosa pine-Douglas fir	PTF
" " - ponderosa pine-red fir	PTF
" " - white fir	WFW
" " - white fir-red fir	WFR
" " - Douglas fir-white fir	DFW
" " - red fir	RF
" " - white fir-red fir	WFRF
" " - Douglas fir-white fir	DFW
" " - red fir	RF
" " - white fir-red fir	WFRF
" " - white fir	WF
" " - red fir	RF
" " - Sweete fir	SWF
" " - white fir-red fir	WFRF
Pasture	Pa
Dairies	Da
Towns	T
Swamp or Impassand	Sw
Indigenous pine	I

Out-over types are designated by the addition of SO to the type symbol (as FIR-SO) and the alignment of all out-over areas with dots: . . . . . The color legend is the same as that for non-out-over types.

Cedar is not considered in any of the types.

by the symbol "ST."

symbols for sugar pine types.

5. Ground cover stage:

namely: (1) barren or lava slopes, (2) bear clover, (3) needle floor, (4) meadow, and (5, 6, 7) three types of brush and reproduction, depending upon their density.

(1) Barren (Ba) - Ground is classified as barren when no ground cover or duff layer is present, although there may be a few scattered trees present as on lava slopes.

(2) Bear clover (B.C.). When an area supports a cover of bear clover, it is typed as such.

(3) Needle floor (N.F.). This type consists of areas beneath heavy fir stands or dry pine slopes where the only ground cover is a layer of duff.

(4) Meadow (Md.). Areas are classified as meadow when grass is the chief ground cover.

(5) Brush or reproduction (Br. or Rp. 0-4). This type may be made up of brush or reproduction or a combination of the two which ranges in density from four-tenths based upon ten-tenths as being a complete cover of brush or reproduction. The ground cover may be either in small, dense clumps, scattered, or both, but averaging from 0 to four-tenths for the area typed.

(6) Brush or reproduction (Br. or Rp. 4.1 to 7). This is the same as number 5 except that the brush or reproduction density ranges from 4.1 to 7.

(7) Brush or reproduction (Br. or Rp. 7.1 to 10). This type is the same as 5 and 6 except that the brush or reproduction density ranges from 7.1 to 10.

Frequently brush, reproduction and bear clover are found intermingling. Where a combination of types is encountered, it will be necessary to delimit this area as a type based on density and make a note that bear clover is present. On the other hand if there is a small scattering of brush or reproduction in a bear clover type, make a note of the brush. Where brush and reproduction represent a special problem, the genera, in order of their predominance, should be listed within the typed area on the map.

The minimum size of a ground cover type will be 40 acres with the exception of barren and lava slopes, meadows, and dense brush or reproduction (7.1 to 10) which will have a minimum of ten acres.

namely: (1) barren or lava slopes, (2) bear clover, (3) meadow floor, (4) meadow, and (5, 6, 7) three types of brush and reproduction, depending upon their density.

(1) Barren (Ba) - Ground is classified as barren when no ground cover or duff layer is present, although there may be a few scattered trees present as on lava slopes.

(2) Bear clover (B.C.). When an area supports a cover of bear clover, it is typed as such.

(3) Meadow floor (M.F.). This type consists of areas beneath [illegible] of duff.

(4) Meadow (Md.). Areas are classified as meadow when grass is the chief ground cover.

(5) Brush or reproduction (Br. or Rp. 0-4). This type may be made up of brush or reproduction of a combination of the two. [illegible] of duff or brush or reproduction. The ground cover may be either in small, dense clumps, scattered, or open, but stands of type 5 fall in [illegible] typed.

(6) Brush or reproduction (Br. or Rp. 4.1 to 7). This is the same as number 5 except that the brush or reproduction density ranges from 4.1 to 7.

(7) Brush or reproduction (Br. or Rp. 7.1 to 10). This type is the same as 6 and 5 except that the brush or reproduction density ranges from type 7.1 to 10.

Frequently brush, reproduction and bear clover are found interspersed. [illegible] a combination of types it should be typed, it will be [illegible] to delimit this area as a type based on density and make a note that bear clover is present. [illegible] brush or reproduction in a bear clover type, make a note of the brush. Where brush and reproduction represent a special problem, the ranger, in order of their predominance, should be limited within the typed area on the map.

The minimum size of a ground cover type will be 40 acres with the exception (7.1 to 10) which will have a minimum of ten acres.

C. Mechanics of the running of the strips and instructions for taking and recording data:

Distances are measured by pacing and directions taken by box compass. Lines will be run at right angles to the drainages as near as any cardinal direction will allow in order that all conditions may be sampled as many times as possible.

Starting at a section corner the mapper offsets 10 chains along the section line, then taking a course in a cardinal direction, begins the first strip through the section which passes through the middle of the first tier of forties.

Ribes data are taken on a continuous strip 16½ feet in width (8¼ feet on each side) and are recorded by 5-chain transects which are numbered consecutively. There are 16 of these transects in a mile. At the end of the strip (section line) a tie is made to the section corner and an offset of thirty chains along the section line. The point is marked and the line continued 10 chains to the quarter section corner after which the mapper returns to the point to begin the second strip. The latter is run 20 chains from the first strip and parallel to it. Data are recorded in the same manner. On reaching the section line, a tie is made to the quarter section corner. In a similar manner the rest of the section is covered. Note on the field map errors of the tie-in giving both distance and alignment as: short 2 chains, right 2 chains. "Short" means that 80 chains appear on the tally register before the section line has been reached and "long" that the section line has been passed. A perfect tie would be designated thus: 0-0.

At a point on the beginning of the strip, five chains within the section, timber plot number one is established. This is a circular plot of 37-ft. radius containing one-tenth of an acre. All of the sugar pine over 12 inches D.B.H. are recorded on the timber data sheet. On a smaller circle of an 18½-ft. radius, using the same center, sugar pine from 0-1 inches, 1-6 inches and 6-12 inches are counted separately according to the three size classes, multiplied by the factor four and recorded in their respective columns. After the plot data are recorded, the mapper will start from the center of the circle and proceed for 10 chains, where plot No. 2 is established. There are eight timber plots 10 chains apart in a mile strip and 32 in a section. The plots are indicated by small circles and numbered consecutively from 1 to 32, corresponding to their position on the map sheet.

Whenever a stream is crossed, the Ribes on the stream type are recorded on the back of the type sheet. Other conditions which are called for on the stream type sheet should be noted at the same time. The Ribes found in the stream type are recorded in the 5-chain transects. Should a strip parallel a water course for some distance, the mapper will offset far enough to get away from the influence of the stream and return to his line as soon as possible. The stream plots will be numbered on the map as they are found.

and recording data:

Distances are measured by pacing and directions taken by box compass. Lines will be run at right angles to the drainages as near as any natural direction will allow in order that they may be mapped as easily as possible.

Starting at a section corner the mapper offsets 10 chains along the section line, then taking a course in a cardinal direction, begins the first strip through the section which passes through the middle of the first tier of forties.

Ribbe data are taken on a continuous strip 16½ feet in width consecutively. There are 16 of these transects in a mile. At the end of the thirty chains along the section line. The point is marked and the line continued 10 chains to the quarter section corner after which the mapper returns to the point to begin the second strip. The latter is run 20 chains from the first strip and parallel to it. Data are recorded in the same manner. On reaching the section line, a tie is made to the quarter section corner. In a similar manner the rest of the section is covered. This gives field map errors of the tie-in giving both distance and alignment as: short 2 chains, right 2 chains. "Short" means that 80 chains appear on the tally register before the section line has been reached and "long" that the section line has been passed. A perfect tie would be designated thus: 0-0.

At a point on the beginning of the strip, five chains within the section, timber plot number one is established. This is a circular plot of 37-ft. radius containing one-tenth of an acre. All of the auger pine over 12 inches D.B.H. are recorded on the timber data sheet. On a smaller circle of an 18½-ft. radius, using the same center, auger pine from 0-1 inches, classes, multiplied by the factor four and recorded in their respective columns. After the plot data are recorded, the mapper will start from the center of the circle and proceed for 10 chains, where plot No. 2 is established. There are eight timber plots 10 chains apart in a mile strip and 32 in a section. The plots are indicated by small circles and numbered consecutively from 1 to 32, corresponding to their position on the map sheet.

Whenever a stream is crossed, the Ribbe on the stream type are recorded on the back of the type sheet. Other conditions which are called for on the stream type sheet should be noted at the same time. The Ribbe found in the stream type are recorded in the 3-chain transects. Should a strip parallel a water course for some distance, it will suffice to run enough to get away from the influence of the stream and return to the line as soon as possible. The stream plots will be numbered on the map as they are found.

The streams are inked in with blue lines and a series of dots closely placed along both sides indicate stream type.

As the mapper progresses along the strip it will be necessary to observe the timber types and type them in lightly by means of small dots. these type lines will be connected when the second, third and fourth strips are run. When offsetting along a section, observe the types and type changes. Quite frequently timber types follow certain slopes (exposures) and ridges.

1. Cut over. Since some cut-over areas represent a different problem from virgin timber, the mechanics for taking and recording data will differ. Cut-over lands fall roughly into two subtypes: (1) clear cut, and (2) partial-cut. In the former very few seed trees have been left and much of the advanced reproduction has been destroyed or burned. A few seed trees either of the desirable or undesirable species have been left and much of the advanced reproduction saved on the partial-cut lands. On the partial-cut areas the data are taken and recorded in the same manner as they are on virgin lands. A count of the sugar pine reproduction and Ribes is made on a continuous strip (16½ ft. wide) through the section where partial cutting has been practiced. If the Ribes count or the sugar pine reproduction count exceeds 400 per acre, data are recorded every tenth chain on a plot one chain long and 16½ feet wide. These areas, where there are no seed trees, are classed as brush type on the timber type map.

PERMANENT RECONNAISSANCE RECORDS

The Ribes data have been summarized on a per acre basis by species for each timber type within the section, and the sugar pine data by timber types and diameter classes. These data have been transferred to township sheets. The timber type field maps were recorded on township plats (scale 2" = 1 mi.) and the types colored according to the standard color chart. The data sheets and the map for each township are filed together in the reconnaissance binder. The ground cover maps, showing brush and reproduction densities, will be transferred from the field maps to similar township plats.

The streams are lined in with pine lines and a series of lots
closely placed along both sides indicate stream type.

As the mapper progresses along the strip it will be necessary
to observe the timber type and type code in field notes. Where
these type lines will be connected when the second, third or
strips are run. Then offsetting along a portion, observe
type changes. Note frequently timber occurs following contour slopes
(exposures) and ridges.

1. Fir strip. Since this strip contains areas supporting a different
from virgin timber, the mechanics for taking and recording data will
differ. Over-over lands fall roughly into two subtypes: (1) clear cut, and
(2) partial-cut. In the former very few seed trees have been left and much
of the advanced reproduction has been destroyed or removed. Trees over
trees either of the desirable or undesirable species have been left and
much of the advanced reproduction has been left undamaged. In the
partial-cut areas the data are taken and recorded in the same manner
as they are on virgin lands. A count of the sugar pine reproduction and
Ribes is made on a continuous strip ($16\frac{1}{2}$ ft. wide) thrown the section
where partial cutting has been practiced. If the Ribes count or the
sugar pine reproduction count exceeds 400 per acre, data are recorded
every tenth plot. A plot was eight long and 16½ feet wide. Three strips
where there are 16 seed trees, are plotted as their type on the regular
type map.

[illegible]

The Ribes data have been summarized on a per acre basis by species
for each timber type within the unit, and the mapper plot data by timber
types and diameter classes. These data have been transferred to tabular
sheets. The timber type field maps were recorded on township plats
(scale 2" = 1 m.) and the types colored according to the standard color
chart. The data sheets and the map for each township are filed together
in the reconnaissance binder. The ground cover maps, showing brush and
reproduction densities, will be transferred from the field maps to similar
township plats.

TABLE NO. 1

SUMMARY AND LOCATION OF AREAS COVERED BY RECONNAISSANCE
1934

Township	Range	Sections by Numbers	Totals	
			Number of Sections	Number Acres
Part A - Sierra National Forest				
4 S.	20 E.	15, 16, 21-28, 34-36	13	6,284
	21 E.	32	1	592
5 S.	20 E.	1, 3, 4, 9-15	10	4,578
	21 E.	4-11, 13-18, 22-29, 32-36	27	17,264
	22 E.	5-9, 16-22, 27-35	21	13,424
	23 E.	12, 13, 24, 25, 35, 36	6	3,520
	24 E.	7, 8, 16-22, 27-35	18	10,200
6 S.	21 E.	1-5, 9-12	9	4,160
	22 E.	1-18, 20-28, 34-36	30	19,000
	23 E.	1-4, 9-15, 19, 23-26, 28-34	23	14,297
	24 E.	1-12, 15-20	18	10,200
7 S.	23 E.	1, 3-18, 20-24, 26-29, 32-36	31	18,778
	24 E.	19, 29-32	5	2,744
8 S.	23 E.	1-4, 10-14	9	5,220
	24 E.	4-8, 18	6	3,200
9 S.	24 E.	1, 2, 12-14, 23-27, 34-36	13	7,025
	25 E.	3-10, 15-23, 26-35	27	15,500
10 S.	24 E.	1-3, 10-12, 14, 15	8	5,120
	25 E.	1-7, 11-14, 23-25, 36	16	9,600
	26 E.	4-9, 15-23, 26-36	26	16,640
11 S.	25 E.	1	1	460
	26 E.	1-9, 11, 12	11	6,060
	27 E.	6, 7	2	1,160
Totals			330	195,326
Part B - Eldorado National Forest				
10 N.	15 E.	2-4, 10, 12-14, 19, 32, 33	10	4,480
	16 E.	2, 10, 11, 14, 15, 22	6	3,480
11 N.	12 E.	1-4, 12	5	3,200
	13 E.	2-6, 8-10, 16	9	5,333
	14 E.	2, 11, 16, 17, 23, 24	6	3,720
	15 E.	4-9, 16-19, 26, 35	12	6,780
12 N.	12 E.	3-20, 22-31, 34-36	31	17,560
	13 E.	17-19, 29, 30, 31	7	3,280
	14 E.	1-4, 11, 12, 14, 15, 22, 25-28, 34-36	16	9,600
	15 E.	6, 7, 18, 28, 29, 31-33	6	4,200
Totals			110	60,533

TABLE NO. 1

SUMMARY AND ROTATION OF AREAS COVERED BY AERIAL SURVEYS
1934

Township	Range	Sections in Detail	Summary: Number of Sections	Summary: Acres
		Part 1 - Interim Bilateral Survey		
4 E.	20 E.	15, 16, 21-28, 34-36	12	7,680
	21 E.	31	1	640
5 E.	20 E.	1, 2, 4, 9-16	10	6,400
	21 E.	4-11, 14-18, 20-29, 32-36	27	17,280
	22 E.	6-9, 16-22, 27-30	12	7,680
	23 E.	13, 18, 24, 25, 30	6	3,840
	24 E.	7, 8, 18-22, 27-35	16	10,240
6 E.	21 E.	1-5, 9-16	9	5,760
	22 E.	1-18, 20-22, 26-28, 32-36	30	19,200
	23 E.	1-4, 9-13, 19, 25-36, 25-36	25	16,000
	24 E.	1-12, 16-20	16	10,240
7 E.	20 E.	1, 7-12, 17-20, 29-32, 41-44	17	10,880
	24 E.	19, 29-32	6	3,840
8 E.	23 E.	1-4, 10-14	8	5,120
	24 E.	4-6, 18	5	3,200
9 E.	24 E.	1, 2, 12-14, 23-27, 34-36	12	7,680
	25 E.	5-10, 15-22, 28-33	27	17,280
10 E.	24 E.	1-3, 10-12, 14, 24	8	5,120
	25 E.	1-7, 11-14, 23-26, 36	25	16,000
	26 E.	4-8, 16-24, 27-34	25	16,000
	27 E.	1	1	640
11 E.	25 E.	1-3, 11, 12	11	7,040
	27 E.	5, 7	2	1,280
		Totals	320	204,800
		Part 2 - Alternate Bilateral Survey		
10 E.	25 E.	3-6, 13, 16-18, 19, 30, 31	13	8,320
	26 E.	6, 10, 11, 14, 15, 22	8	5,120
11 E.	25 E.	1-4, 12	6	3,840
	26 E.	2-5, 8-10, 16	8	5,120
	27 E.	5, 11, 16, 17, 25, 34	8	5,120
	28 E.	4-8, 15-18, 20, 29	12	7,680
12 E.	27 E.	2-6, 8-11, 14-24	21	13,440
	28 E.	17-19, 29, 30, 32	7	4,480
13 E.	27 E.	1-4, 11, 13, 14, 23, 24-26, 33-36	16	10,240
	28 E.	1, 7, 18, 28, 29, 31-36	13	8,320
		Totals	119	76,160

TABLE NO. 1 (Cont'd.)

Township	Range	Sections by Numbers	Totals	
			Number of Sections	Number Acres
Part C - Stanislaus National Forest				
4 N.	16 E.	1-5, 10, 11, 14, 15	9	5,710
	17 E.	4, 5, 6	3	1,500
5 N.	16 E.	1, 2, 13, 14, 23-27, 34, 35	11	6,920
	17 E.	1, 2, 7, 11-14, 17-20, 22-34	20	13,160
	18 E.	5-8, 17, 19, 20	7	3,950
Totals			50	33,560
Part D - Yosemite National Park				
1 N.	19 E.	1-3, 10-15, 22, 23, 27	12	8,360
	20 E.	4-8, 8, 18, 22, 23, 25, 32, 35, 36	11	6,620
	21 E.	30	1	400
	22 E.	7	1	640
2 N.	19 E.	26, 27, 34	3	800
1 S.	20 E.	1-3, 12, 13, 36	6	3,640
	21 E.	6, 7	2	400
2 S.	20 E.	2, 11, 13, 24, 25, 36	6	2,420
	21 E.	19	1	640
	22 E.	34, 35	2	1,280
3 S.	20 E.	1, 12, 13, 21-27, 35, 36	12	8,720
	21 E.	5, 8, 9, 16, 17, 20, 21, 27-29, 32-36	15	9,600
	22 E.	2, 3, 8-17, 21-25	17	10,880
	23 E.	5-8, 17-20	8	5,120
4 S.	21 E.	1-5, 8-11, 14-17, 20-29, 33-36	27	17,280
	22 E.	19, 29-31	4	2,560
5 S.	21 E.	1-3, 12	4	2,560
Totals			122	77,920
Grand Totals			572	368,329

TABLE NO. 2

RECONNAISSANCE COSTS FOR 1934

Classification of Expenditures	(7.315-1) Yosemite	(7.315-2) Sierra	(7.315-3) Eldorado	(7.315-4) Stanislaus	Total Cost
Salaries of permanent men	$1,084.75	$2,153.83	-	-	$3,238.58
Wages of temporary men	3,007.30	3,041.73	$1,428.34	$1,117.01	8,594.38
Subsistence supplies	435.70	631.65	-	-	1,067.35
Equipment	1.58	1.58	-	-	3.16
Other supplies	76.23	45.99	-	17.44	139.66
Transportation and travel	544.44	313.89	1.48	43.10	902.91
Total Expenditures	$5,150.00	$6,188.67	$1,429.82	$1,177.55	$13,946.04

Table No. 2 gives the total costs of the reconnaissance work for 1934 but it does not include the time spent by 10 permanent men who spent two weeks on reconnaissance during October nor the three Civilian Conservation Corps men from Yosemite National Park. The cost per acre for California reconnaissance amounted to $0.038.

Classification of Equipment	(7.318-1)	(7.318-2)	(7.318-3)	(7.318-4)	
Salaries of permanent men	11,084.76	63,189.60	-	-	82,088.36
Wages of temporary men	1,607.76	5,711.76	11,174.16	11,174.16	9,881.84
Rental storage supplies	490.72	641.65	-	-	1,087.38
Insurance	1.32	1.65	-	-	3.16
Other supplies	17.27	15.72	-	17.44	139.65
Transportation and travel	314.14	618.64	1.40	40.11	2[illegible]
Total	13,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table No. 2 gives the total costs of the reconnaissance work for 1914 but it does not include the time spent by [illegible] spent two weeks in reconnaissance during October for the [illegible] Conservation Camp this trail to Walnut Park. [illegible] California reconnaissance amounted to $0.038.

SCOUTING FOR BLISTER RUST IN CALIFORNIA AND OREGON, 1934

By
George A. Root
Associate Pathologist

INTRODUCTION

The gradual southward spread of blister rust since its first discovery in the Pacific northwest in 1921, has lead to the belief that it would eventually make its way into California. The various discoveries of infection farther south in Oregon from year to year in a southerly direction have given evidence that it would be found in this state before a great lapse of time.

Prior to 1933, extensive scouting had taken place in northern California and southern Oregon for a number of years. In 1933, funds were such that a larger organization could be employed with the result that much intensive work was done.

In 1929 and 1931 the rust was found on Ribes 50 miles north of the California line in Curry County, Oregon. In 1933 the rust was discovered on both hosts 110 miles north of the boundary at Bohemia Mt. in the Cascades. In 1934 this distance was reduced by ten miles when infection was found near City Creek Camp in the upper drainage of the Umpqua River.

In 1934 an average of four men and two cars were available for the work from July 15 to October 20. With the southern Oregon territory so closely linked with that of northern California, scouting was done in both states by the California contingent. There were no men available from the Oregon personnel for scouting in that state.

LOCATION OF WORK

Previous to 1933, the county had generally been used as a working unit and records kept accordingly. In 1933, the unit took the form of a region. This seemed to be an improvement. As the scouting program for 1934 comprised areas both in California and Oregon of similar geographic conditions, the regions indicated for northern California may readily be extended to include like areas in southern Oregon. (See Map of Scouting Regions)

These may be roughly classed as follows: Coastal, intermountain, east central and eastern. For the present, the coastal region may be considered to comprise an area from the middle of Coos County, Oregon to the southern boundary of Humbolt County, California and east to the summit of the Coast Range. This may be designated as Region 1. The intermountain region which is mainly drained by the Rogue and Klamath Rivers and their tributaries extends from the Coquille River in Oregon to the Trinity River in California and from the Coast Range east to the Pacific Highway as far south as Red Bluff in California, and in Oregon to a line drawn between Cottage Grove and a point where the Pacific Highway crosses the California-Oregon boundary. This may be designated as Region 2. The east central region includes that area east of the intermountain region to the summit of the Cascades and Sierra Nevada respectively. This may be designated as Region 3. The eastern region includes that territory east of the summit of the two ranges, taking in the Warner Mountains and all the territory to the Nevada boundary as far south as Loyalton in California. This may be designated as Region 4.

SCOUTING FOR ASTER RUST IN CALIFORNIA AND OREGON, 1954

by

George B. Hoot
Associate Pathologist

INTRODUCTION

The general epidemiological aspects of blister rust cause its first discovery in the Pacific northwest in 1921, due to the belief that it would probably pose a very grave threat to white pine culture in California. Two serious discoveries of infection farther south in Oregon first gave an impetus to a scouting effort to prove conclusively that it would be found in this state before a great lapse of time.

Prior to 1932, extensive scouting had taken place in northern California and southern Oregon for a number of years. In 1932, rusts were found that a larger organization could be employed with the result that much intensive work was done.

In 1934 and 1935 the rust was found on nine 5- miles north of the California line in Curry County, Oregon. In 1935 the rust was discovered on both hosts 110 miles south of the boundary at Gasquet, in the Smith River Canyon. In 1954 this distance was reduced by ten miles when infection was found near Orick Creek Camp in the upper drainage of the Umpqua River.

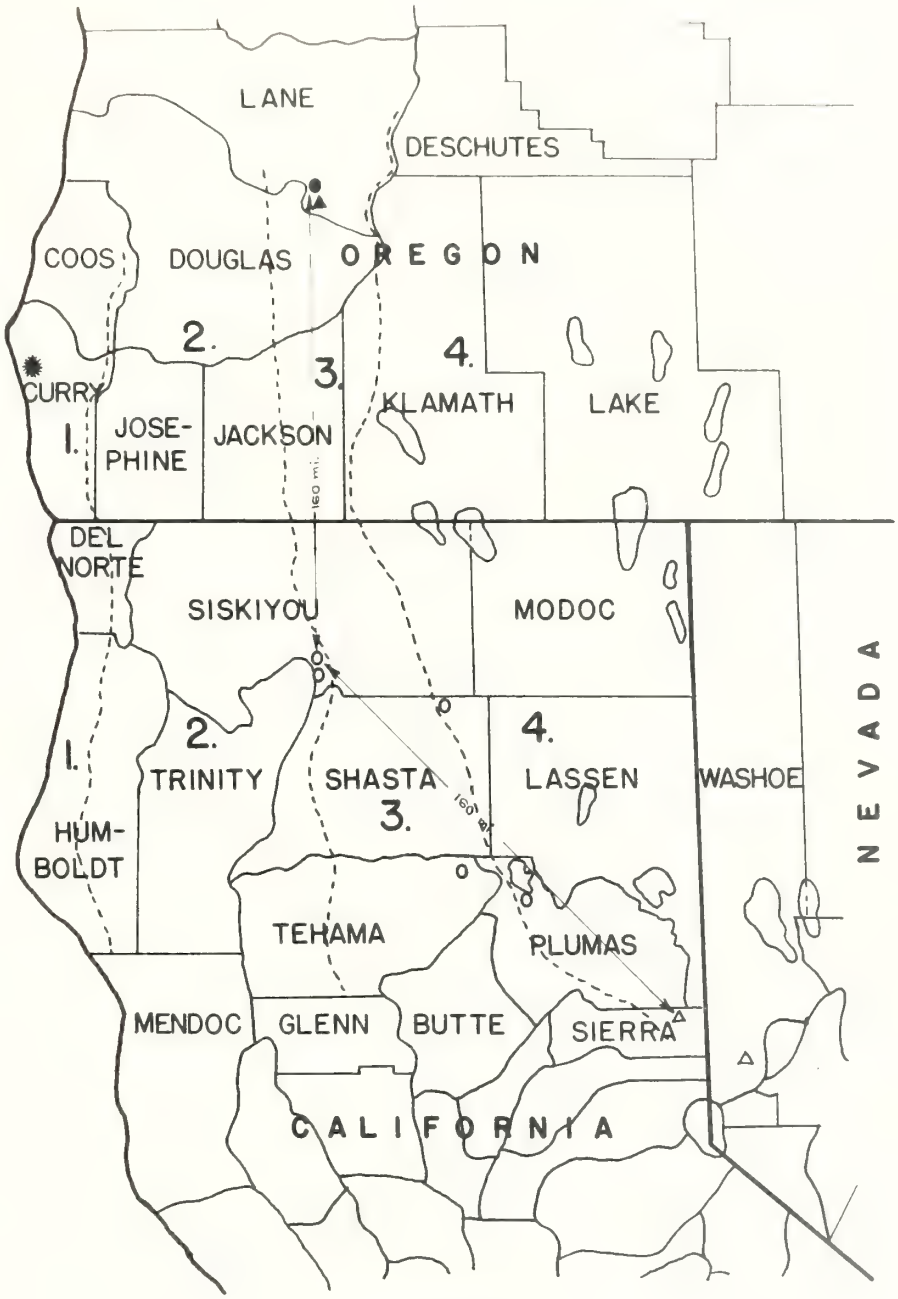
In 1954 an overlap of four men and two cars were available for the work from July 10 to October 30. Also the southern Oregon territory so closely timed with that of northern California, scouting was done in both states by the California control. There were no men available from the Oregon personnel for scouting in that state.

LOCATION OF AREA

Previous to 1933, the county had generally been used as a working unit and results kept accordingly. In 1933, the unit took the form of a region. This seemed to be an improvement. As the scouting program for 1934 progressed areas both in California and Oregon of similar geographic conditions, the regions indicated for northern California may readily be extended to include area in southern Oregon. (See Map of Scouting Regions)

These may be roughly classed as follows: Coastal, intermountain, west central and eastern. For the present, the coastal region may be considered to comprise an area from the middle of Coos County, Oregon to the southern boundary of Humboldt County, California and west to the summit of the Coast Range. This may be designated as Region 1. The intermountain region which is mainly drained by the Rogue and Klamath Rivers and their tributaries extends from the Cowhide River in Oregon to the Trinity River in California and from the Coast Range west to the Pacific Highway as far south as Red Bluff in California, and in Oregon to a line drawn between Cottage Grove and a point where the Pacific Highway crosses the California-Oregon boundary. This may be designated as Region 2. The west central region includes that area west of the intermountain region to the summit of the Cascades and Sierra Nevada respectively. This may be designated as Region 3. The eastern region includes that territory east of the summit of the two ranges, lacking in the Turner Mountains and all the territory to the Nevada boundary as far south as Lopezton in California. This may be designated as Region 4.

SCOUTING REGIONS - 1934



LEGEND

- ● C. ribicola on Ribes - 1934
- ▲ C. ribicola on Pines - 1934
- ✹ C. ribicola on Ribes - 1929 – 1931
- o C. sp. (?), on Ribes - 1934
- △ Pinyon Pine
- ----- Regional Scouting Boundary

1934
ANNUAL REPORT
G. A. ROOT

RESULTS

The first scouting was done in the Warner Mountains near Lakeview in southern Oregon, and east of Alturas in northeastern California. This area was selected because of the discovery of the rust in 1933 near Austin, Oregon and the presence of Ribes petiolare in great abundance in the Warner Mountains on the Oregon side. This species is also found in the range to the northwest of Lakeview where it was noted on Bauer's Creek. It is found as far south as Kelley Creek, less than two miles from the California line, but intensive search failed to reveal it on streams in California. To the southwest of Lakeview in the vicinity of Drew Reservoir and Dog Lake, only R. inerme and R. aureum were found with very poor pine association. Other Ribes besides R. petiolare found in the Warner Mountains both in Oregon and California are R. inerme, R. viscossissimum, R. cereum, R. montigenum, R. velutinum and R. aureum. With the exception of R. aureum these species are found in good association with five-needled pines. Inspections were made as far south as the Patterson Ranger Station, but it is evident that little or no scouting is warranted in the Warner Range south of the Alturas-Cedarville Highway.

A Rust Near Mt. Shasta City: After completing the work in the Warner Mountains, scouting was undertaken in the Mt. Shasta region, long considered good territory for the establishment of white pine blister rust. On July 30, a rust was found on R. cruentum on the south slope of Mt. Bradley west of Dunsmuir. Later on, infection was discovered three miles west of Mt. Shasta City. The location and site conditions of these points would seem to indicate that this rust was Cronartium ribicola. After intensive search on five-needled pines in close proximity, no diseased trees were found. Examination of many R. nevadense revealed no signs of rust. It was beginning to appear that the infections were not of local origin but of long distance spread. Careful search in a westerly and northerly direction brought no results.

During October two more infections were found on R. cruentum, one about nine miles south of Bartle on the Red Mountain road and the other near the southern end of Lake Almanor.

The finding of this rust near Mt. Bradley and Mt. Shasta City is mentioned in this report because of its unique location. The latter is approximately 160 miles south of the southernmost known C. ribicola infection in Oregon in the Umpqua drainage and about the same distance from the nearest known group of pinyons (not known whether infected) near Loyalton, California. Intermediate points of infection link the rust at Mt. Shasta City with the pinyon belt; none were found between this city and the Umpqua River.

The search for the rust to the east and south of Mt. Shasta City was made in both Regions 3 and 4. A considerable amount of territory was covered in the McCloud and Pit River drainages. Although some of this country is extremely arid, one point is worthy of mention--Burney Falls where the water creates a humid and moist condition at its base. Here may be found R. cruentum, R. nevadense, and R. inerme. Pine associations however, are but fair. Scouting was done in the vicinity of Mt. Lassen, Greenville, Quincy, Chester and Loyalton. The Mt. Lassen area affords excellent scouting with an abundance of Ribes and excellent pine associations.

The first scouting was done in the Warner Mountains near Lakeview in southern Oregon, and east of Alturas in northeastern California. Cole also made selective inspection of the rust in 1932 near Anadia, Oregon and the presence of *Ribes petiolare* in great abundance in the Warner Mountains on the Oregon side. This species is also found in the region to the southward of Lakeview, less than two miles from the California line, but intensive search failed to reveal it on streams in California. To the southward of Lakeview in the vicinity of Upper Klamath and Dog Lake, only *R. lacustre* and *R. petiolare* were found with any appreciable abundance. Other *Ribes* species *R. montigenum*, *R. inerme*, *R. cereum*, *R. roezlii*, *R. viscosissimum* and *R. nevadense*. With the exception of *R. petiolare* these species are found in pool associations with *Pinus monticola* and other species of pine. Inspections were made as far south as the Feather River Canyon in California but little or no success attended the search. It is to be noted that the Warner Range south of the Alturas-Goldenville highway.

A Rust Near Mt. Shasta City: After completing the work in the Warner Mountains, scouting was undertaken in the Mt. Shasta region, first examining good territory for the establishments of white pine rust. On July 26, rust was found on *R. cruentum* on the south slope of Mt. Shasta City, Siskiyou Co., in-cystia was discovered three miles west of Mt. Shasta City. The location and also conditions of there do its still seem to indicate that rust was *Cronartium ribicola*. After intensive search in this close proximity, no diseased trees were found. Examination of many *R. petiolare* revealed no signs of rust. It was impossible to locate the infection more or less local origin but of long distance spread. Several search in a westerly and northerly direction brought no results.

During October two more infections were found on *R. cruentum*, one about nine miles south of Dunsmuir on the Old Pacific road and the other near the southern end of Lake Almanor.

The finding of this rust near Mt. Bradley and Mt. Shasta City is mentioned in this report because of its unique location. The latter is approximately 120 miles south of the southernmost known *C. ribicola* infection in Oregon in the Umpqua drainage and about the same distance from the nearest known group of pinyons (not known whether infected) near Loyalton, California. Intermediate points of infection like the rust at Mt. Shasta City with the pinyon belt; none were found between this city and the Umpqua River.

The search for the rust to the east and south of Mt. Shasta City was done in both Regions 5 and 6. A considerable amount of scouting was covered in the Modoc and Pit River drainages. Although none of this country is extremely arid, one point is worthy of mention--Surprise Valley where the water crosses a humid and moist country at the time. There may be found *R. cereum*, *R. nevadense*, and *R. inerme*. The associations however, are but fair. Scouting was done in the vicinity of Mt. Lassen, Dyerville, Quincy, Chester and Loyalton. The Mt. Lassen area affords excellent scouting with an abundance of white and excellent pine associations.

In Region 4 in Oregon, scouting was done west of Klamath Lake from Pelican Bay and Badger Lake on the north to the California boundary on the south. This is fair scouting country, but pine and Ribes associations are not exceptionally good. Some of the species found are R. inerme, R. lobbii, R. viscosissimum, R. klamathense, R. lacustre, R. velutinum and R. sanguineum.

The portion of Region 3 in Siskiou County, California, with the exception of the Mt. Shasta area offers little in the way of good inspection points. Region 3 of Oregon, however, comprises territory in which the rust will inevitably move southward. In this area are included the upper drainages of the Umpqua and Rogue Rivers with the corresponding high mountains between their numerous tributaries.

White Pine Blister Rust in the Upper Umpqua Drainage: On September 11, blister rust was found about one-fourth mile south of City Creek Camp on Steamboat Creek, a tributary of the Umpqua River. In Sec. 17; T. 23 S., R. 2 E; three western white pines and three R. sanguineum bushes were found infected within a radius of 125 feet. There were numerous cankers on one tree and one bush was heavily infected. This infection dates back to 1927. The closest distance to R. bracteosum was considerably over a mile and this was not infected.

Most of the scouting in Region 2 of Oregon was done in Jackson and Josephine Counties in which are located a large part of the Siskiyou Mts. of that state. These mountains harbor numerous species of Ribes, but at many places not in good association with pine. The drainage of Althouse Creek in Josephine County possesses many good points of inspection as well as the Swede Basin Country. In Jackson County, Dutchman's Peak and Ashland Peak of relatively high elevation afford good inspection points with a considerable number of R. cruentum. Grouse Creek in the southern part of the county is excellent scouting territory with an abundance of R. cruentum and R. sanguineum. Sturgis and O'Brien Creeks, branches of the Applegate River, offer exceedingly good sites for inspections. One noticeable feature of the Applegate country is the lack of R. bracteosum.

Region 2 of California is considered by many to be the most important scouting area in the state. It embraces the greater part or middle portion of the Klamath River drainage and its main tributaries. Some of these coming in from the north harbor hundreds of R. bractosum bushes. This is especially true of Middle Creek and the East Fork of Indian Creek. Only at the upper reaches, however, does there seem to be good association with pines.

To the west of Orleans in extremely rugged country, R. bracteosum occurs on many of the streams in fair association with pines. To the south in the vicinity of Willow Creek in the drainage of the Trinity River, many good inspection points were found. The drainage of the South Fork of the Trinity is good scouting country. The southernmost point of inspection made in Region 2, was at Forest Glen where R. bracteosum, R. sanguineum, and R. cruentum were found with good pine association.

The Marble Mountains, a terrain of high peaks situated between the Klamath, Scott and Trinity Rivers, are the headwaters of numerous tributaries of these rivers. This area harbors numerous species of Ribes, such as R. viscosissimum, R. nevadense, R. sanguineum, R. lobbii, and R. cruentum. No R. bracteosum was found. Excellent pine and Ribes associations do occur, but considerable territory warrants only passing inspection. The best associations

In Region 4 in Oregon, scouting was done west of Klamath Lake from Pelican Bay and Badger Lake on the north to the California boundary on the south. This is fair scouting country, but pine and fir reproduction are not exceptionally good. None of the species (Pinus ponderosa, P. lambertiana, P. jeffreyi, Abies concolor, A. magnifica, Libocedrus decurrens, Pseudotsuga taxifolia) are reproducing well.

The portion of Region 3 in Siskiyou County, California, was not examined. Simple area offers little in the way of good temperate points. Region 3 of Oregon, however, contains the valley in which the great salt lake formerly existed. In this area are included the upper drainages of the Deschutes and Crane Prairie with the corresponding high mountain peaks and numerous tributaries.

Quite fine plantings (pp) in the Upper Deschutes: On September 11, Silver Tree was found about forty-fourth mile south of City Creek on Fivemile Creek, a tributary of the Upper Deschutes. In Sec. 19; T. 21 S., R. 7 E., three scattered white pines and about 5 ponderosa pines were found infected with a rust. There were numerous cankers on the trees and they was heavily infected. This infection dates back to 1927. The nearest infection to P. ponderosa was considerably over a mile and they were not infected.

Most of the scouting in Region 2 of Oregon was done in Jackson and Josephine Counties in which are found a large part of the sticky type of white pine. These counties in their mountainous regions of Siskiyou, yet as many places not in good association with pine. The Siskiyou Mts. of California possessed many good points of importance in Jackson County. In Jackson County, Dutchman's Peak and Applegate Peak of relatively high elevation afford good inspection points from which a considerable amount of P. ponderosa, Pseudotsuga taxifolia and Libocedrus decurrens can be seen. Grouse Creek in the southern part of the county is especially heavily with an abundance of P. ponderosa, Pseudotsuga taxifolia and Libocedrus decurrens. Tributaries of the Applegate River, often exceedingly good sites for inspection. One noticeable feature of the Applegate country is the lack of Libocedrus.

Region 2 of California is considered by many to be the most important scouting area in the state. It embraces the greater part or whole portion of the Klamath River drainage and its main tributaries. Some of these crossing in from the north Smoky Mountain of P. ponderosa. Pseudotsuga taxifolia and Libocedrus decurrens. Only at the upper reaches of Middle Creek and the Deer Fork of Indian Creek. Only at the upper reaches, however, does there seem to be good association with pines.

To the west of Orleans in extremely rugged country, P. ponderosa occurs on many of the ridges in fair association with other species. In the area in the vicinity of Willow Creek in the drainage of the Trinity River, many good inspection points were found. The drainage of the South Fork of the Trinity is good scouting country. The southernmost point of inspection made in Region 2 was at Tyrrel Glen where P. ponderosa, P. lambertiana, Pseudotsuga taxifolia were found with good pine association.

The Marble Mountains, a terrain of high peaks situated between the Klamath, Scott and Trinity Rivers, are the headwaters of numerous tributaries of these rivers. This area offers numerous scouting points of P. ponderosa, P. lambertiana, P. monticola, P. jeffreyi, Abies concolor, A. magnifica, Libocedrus decurrens, Pseudotsuga taxifolia. Excellent camp sites are found. The best associations considerable territory warrants only passing inspection. The best associations

are on the canyon sides and not on the ridges. Shackleford and Kelsey Creeks present unusually good scouting territory. Three species of five-needled pines occur in the Marble Mountains, Pinus monticola, P. lambertiana and P. albicaulis.

Region 1 takes in the coastal fog belt and is thought by some to be the most favorable section for the spread of the rust into California. Inspections were made on the Oregon coast at the usual points in the vicinity of Gold Beach, Brush Creek, Coquille and Sumner. At the latter place a planting of P. strobus was inspected again this year but no disease was found. Inspections were made between Powers and Illahe. A new road up the Pistol River facilitates reaching several good inspection points as far as Pyramid Rock, where R. cruentum and pine occur in good association. Some scouting was done on Winchuck River, where R. bracteosum is abundant, but with poor pine association.

Region 1 in California, comprises most of Del Norte and the western part of Humbolt County. Del Norte County was quite thoroughly covered. A considerable portion of the North Fork of the Smith River can be eliminated from future scouting. New pine and Ribes associations were found on the South Fork of the Smith River and some of its tributaries. Inspections were made on the coast as far South as the mouth of the Klamath River.

Table No. 1 shows number of Ribes and pines by species examined for blister rust:

TABLE NO. 1

NUMBER OF RIBES AND PINES, BY SPECIES, EXAMINED FOR BLISTER RUST NORTHERN CALIFORNIA AND SOUTHERN OREGON, 1934

Host Species	Number of Host Plants Examined in Each Region				
	Region 1	Region 2	Region 3	Region 4	All Regions
Ribes					
R.bracteosum	1,987	2,959	402		5,348
R.klamathense	69	3,121	958		4,148
R.cruentum	67	2,688	266	145	3,166
R.viscosissimum		1,612	335	227	2,174
R.binominatum		820	70	15	905
R.lacustre		430	250	50	730
R.lobbii		608	161		769
R.marshallii	15	1,135	185		1,335
R.sanguineum	148	1,814	442		2,404
R.roezli			525	745	1,270
R.nevadense		1,042	108	215	1,365
R.inerme		157	67	1,300	1,524
R.divaricatum	5	43			48
R.cereum			134	191	325
R.aureum		2	3	169	174
R.velutinum		17			17
R.montigenum				87	87
R.vulgare			1		1
R.petiolare				751	751
All Ribes	2,291	16,448	3,907	3,895	26,541
Pines					
P.lambertiana	215	3,627	476		4,318
P.monticola	567	1,213	69	453	2,302
P.albicaulis				328	328
All Pines	782	4,840	545	781	6,948

TABLE NO. 1

Host Species	Numbers of Mosquitoes Examined in Each Section				
	Section 1	Section 2	Section 3	Section 4	All Sections
Birds					
A. bracteosum	1,027	2,958	402		5,386
B. klamathensis	69	3,121	636		4,147
C. crassatum	67	3,466	286	146	3,965
D. vicegeniculatus		1,412	703	327	2,442
E. elongiratum		329	27	12	368
F. lacustris		460	62	80	602
G. labbii		609	161		770
H. mariahlii	19	1,155	183		1,357
I. annulipenne	146	1,214	442		1,802
J. Farauti			289	146	435
K. punctipennis		1,040	206	234	1,480
L. immane		127	67	1,260	1,454
M. occidentalis	6	40			46
N. castanea			124	121	245
O. quasipunctipennis		2	4	167	173
P. multistriatus		17			17
Q. woodwardii				87	87
R. walkeri			1		1
S. pallidiventris				761	761
All Birds	2,361	16,466	3,907	3,555	26,289
Cows					
T. pseudopunctipennis	218	3,177	476		4,871
U. quadriannulatus	567	1,218	69	486	2,340
V. albimanus				238	238
All Cows	785	4,395	545	724	6,449

COMMENTS AND RECOMMENDATIONS

Two of the most important features of the scouting program during 1934, were the discovery of a rust of unknown identity near Mt. Shasta City and of C. ribicola in the upper drainage of the Umpqua River in Oregon. The first makes it evident that in some localities both pinyon rust and white pine blister rust will be present on Ribes with the attending difficulty of differentiating between the two. The second indicates there are pockets of infection farther south in the upper Umpqua drainage and possibly in the Rogue River drainages. No rust was found at Brush Creek in Curry County, Oregon. Its presence there was last observed in 1931.

The presence of R. petiolare in the Warner Mountains warrants continued scouting in that region. The range of mountains leading from the Paulina Mountains, south of Bend to Lakeview, should be covered during the 1935 season to ascertain if the rust may have spread in a southerly direction from the Cascades. Scouting should be done from the upper Umpqua drainage, through the Cascades to the California line. Certain areas in the Siskiyous, particularly in the Salice country should receive attention in 1935.

In California, inspections should be made at the higher elevations in the Sierra Nevada as far south as Lake Tahoe. The northwestern part of the state should be covered as far south as the highway running between Fortuna on the coast and Red Bluff on the Pacific Highway.

The year 1934 was a poor one for the long distance spread of blister rust. This was shown by the lack of infection on Ribes at comparatively short distances from infected pines at City Creek Camp in the upper Umpqua drainage. In view of this, a good deal attention was paid to the inspection of pines in all areas covered.

COMMENTS AND RECOMMENDATIONS

Two of the most important features of the scouting program during 1934, were the discovery of a rust of unknown identity near Mt. Shasta City and of D. frijolia in the upper drainage of the Umpqua River in Oregon. The first named is evident that in some localities both white rust and white pine blister rust will be present in tubes with the attending difficulty of differentiating between the two. The second instance there are prospects of infection further south in the upper Umpqua drainage and possibly in the Rogue River drainage. No rust was found at Bread Creek in Curry County, Oregon. Its presence there was last observed in 1931.

The presence of D. pallidae in the Sawtooth Mountains requires scouting in that region. The range of mountains leading from the Pauline Mountains, south or East to Lakeview, should be covered during the 1935 season to ascertain if the rust may occur in a profitably direction from the Sawtooth location should be done from the upper Umpqua drainage, adjacent the Cascades in the California line. Certain areas in the Siskiyou, particularly in the Salmon country should receive attention in 1935.

In California, inspections should be made at the higher elevations in the Sierra Nevada as far south as Lake Tahoe. The northwestern part of the state should be covered as far south as the Hilgard Junction Ashland area on the Crest and Red Bluff on the Pacific Highway.

The year 1934 was a poor one for the long distance spread of blister rust. This was shown by the lack of infection on ribes at comparatively short distances from infected pines at Gilty Creek Camp in the upper Umpqua drainage. In view of this, a good deal attention was paid to the inspection of pines in all areas covered.

EDUCATIONAL WORK, CALIFORNIA, 1934

By
George A. Root
Associate Pathologist

This phase of the blister rust program took the form of lectures, supplemented by photographs and specimens, at the various headquarters of the eradication units. These were given for the benefit of the NIRA personnel. It was essential that the men be informed as to the object of the work and means of control.

In early 1934, a short report of the work for 1933 was sent to the Agricultural Commissioners, Farm Advisors and members of other agencies interested in the control program. On May 1, a broadcast of the year's activities for the West for 1933 was given over Station KGO in San Francisco. On December 4, a talk supplemented by lantern slides was given before the plant pathology classes of the University of California at Berkeley.

Specimens and literature were sent to a number of individuals, schools and colleges on request. Some of this is to replenish depleted stocks of specimen material which had been used in classroom work in botanical and plant pathological studies.

EDUCATIONAL WORK, CALIFORNIA, 1934

George A. Root
Associate Pathologist

This phase of the blight work progressed under the form of lectures, supplemented by plate-type and moulding, at the various headquarters of the eradication units. These were given for the benefit of the AAA appraisers. It was essential that the men be informed on the object of the pick and weed of control.

In early 1934, a short report of the work for 1933 was sent to the Agricultural Correlationers, Farm Advisory and Agency of other Agencies later held in the central regions. Dr. Coy I. a Breakfast of the year's activities for the Year for 1933 was given Station for in the Pacific. Dr. Coy gave a talk summarized by Lantern slides and given before the class pathology classes of the University of California at Berkeley.

Specimens and literature were sent to a number of individuals, schools and colleges on request. Some of this is to replenish depleted stocks of specimen material which had been used in Classroom work in Botany and plant pathological studies.

BLISTER RUST CONTROL WORK IN COLORADO AND WYOMING
1934

Blister rust control work which was initiated in Colorado and Wyoming constituted the subject of a cooperative agreement between the Bureau of Entomology and Plant Quarantine and the Department of Forestry of the Colorado Agricultural College in Colorado; and between the Bureau of Entomology and Plant Quarantine and the Botany Department of the University of Wyoming in Wyoming. The work was cooperatively organized upon the basis of these memorandums. The agreements are as follows:

MEMORANDUM OF UNDERSTANDING
between
THE BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
U. S. DEPARTMENT OF AGRICULTURE
and
THE BOTANY DEPARTMENT, UNIVERSITY OF WYOMING
Relative to
Cooperative White Pine Blister Rust Control Work in Wyoming
Effective July 1, 1934

---000---

A. The BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE agrees to:

(1) Pay the salaries and necessary travel expenses of one or more employees who shall conduct blister rust control work in Wyoming.

(2) Generally supervise and conduct -

(a) Surveys to determine location and value of white pine and numbers and kinds of associated Ribes.

(b) To determine by field scouting, whether or not white pine blister rust is present in this State,

(3) So far as possible to determine the cost of local control in the white pine type of Wyoming, and to demonstrate the practical application of control practices.

B. THE BOTANY DEPARTMENT, UNIVERSITY OF WYOMING agrees to:

(1) Use its regular employees, so far as their other duties permit, in assisting the employees of the Bureau of Entomology and Plant Quarantine in the activities enumerated above;

(2) To make available to the employees of the Bureau of Entomology and Plant Quarantine all technical records available regarding location and distribution of white pine and Ribes in Wyoming;

(3) To assist the employees of the Bureau of Entomology and Plant Quarantine with all possible technical advice;

(4) To provide such office space and facilities as may be necessary during the course of the field season.

C. IT IS MUTUALLY AGREED THAT:

(1) This memorandum may be terminated at any time by any one of the parties by written notice, and may be amended by written mutual agreement;

(2) All official records and reports of work performed under this agreement shall be open to inspection by any or all parties to this agreement, that all findings of blister rust made by any party to this agreement shall be promptly reported to all other parties to this agreement, and that all specimens collected by any party to this agreement which are suspected of being infected with blister rust shall be submitted promptly to the Bureau of Entomology and Plant Quarantine for final determination.

MEMORANDUM OF UNDERSTANDING

between

THE BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

U. S. DEPARTMENT OF AGRICULTURE

and

THE BOARD OF TRUSTEES, UNIVERSITY OF WYOMING

Relative to

Cooperative White Pine Blister Rust Control Work in Wyoming

Effective July 1, 1934

A. The BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE agrees to:

(1) Pay the salaries and necessary travel expenses of one or more employees who shall conduct blister rust control work in Wyoming.

(2) Generally supervise and conduct -

(a) Surveys to determine location and value of white pine and numbers and kinds of associated Ribes.

(b) To determine by field scouting, whether or not white pine blister rust is present in this State,

(3) So far as possible to determine the cost of local control in the white pine type of Wyoming, and to demonstrate the practical application of control practices.

B. The BOARD OF TRUSTEES, UNIVERSITY OF WYOMING agrees to:

(1) Use its regular employees, so far as their other duties permit, in assisting the employees of the Bureau of Entomology and Plant Quarantine in the activities enumerated above;

(2) To make available to the employees of the Bureau of Entomology and Plant Quarantine all technical records available regarding location and distribution of white pine and Ribes in Wyoming;

(3) To assist the employees of the Bureau of Entomology and Plant Quarantine with all possible technical advice;

(4) To provide such office space and facilities as may be necessary during the course of the field season.

C. IT IS MUTUALLY AGREED THAT:

(1) This memorandum may be terminated at any time by any one of the parties by written notice, and may be amended by written mutual agreement;

(2) All official records and reports of work performed under this agreement shall be open to inspection by any or all parties to this agreement. That all timbers of blister rust made by any party to this agreement shall be promptly reported to all other parties to this agreement, and that all specimens collected by any party to this agreement are suspected of being infected with blister rust shall be submitted promptly to the Bureau of Entomology and Plant Quarantine for final determination.

(3) The results of the cooperative work may be published jointly, or upon mutual agreement by either cooperating party, due credit being given to the cooperating agencies. All manuscripts therefor shall be criticised by the cooperating parties before publication; and all form letters, bulletins and any other circulars to be mailed in penalty envelopes shall be submitted in manuscript form for approval by the Bureau of Entomology and Plant Quarantine before being printed or distributed;

(4) Obligations by the Bureau of Entomology and Plant Quarantine are contingent upon appropriations being made therefor by Congress; and no funds of the United States shall be expended in compensation for host plants destroyed in control work;

(5) For the Fiscal Year beginning July 1, 1934, the Bureau of Entomology and Plant Quarantine shall contribute in value approximately $9,000.00 to the support of this cooperative work, the Botany Department of the University of Wyoming shall contribute in value approximately $1000.00; thereafter the amount to be contributed by each shall be determined and agreed upon by supplemental correspondence.

Date:	Signature:
August 23, 1934	A. G. Crane President
November 9, 1934	Lee A. Strong Chief, Bureau of Entomology and Plant Quarantine

(3) The refusal of the cooperator [illegible] to [illegible] or upon mutual agreement by either cooperating party, due notice being given to the cooperating agencies. All communications hereafter shall be restricted by the cooperating parties hereto publicized, and [illegible] letters, bulletins and any other circulars to be mailed in penalty envelopes shall be submitted in manuscript form for approval by the Bureau of Insect and Plant Quarantine before being printed or distributed.

(4) Obligations by the Bureau of Entomology and Plant Quarantine are contingent upon appropriations being made therefor by Congress; and no funds of the United States shall be expended in connection [illegible] plants destroyed in control work;

(5) For the Fiscal Year beginning July 1, 1931, the Bureau of Entomology and Plant Quarantine shall contribute in value approximately $5,000.00 to the support of this cooperative work, the Entomological Department of the University of Wyoming shall contribute in value approximately $1000.00; therefore the amount to be contributed by each shall be determined and agreed upon by exploratory correspondence.

Date: August 20, 1931

Signed:

W. H. Larimer
President

November 5, 1931

Leon M. Estabrook
Chief, Bureau of Entomology and Plant Quarantine

MEMORANDUM OF UNDERSTANDING

between

THE BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE,
U. S. DEPARTMENT OF AGRICULTURE

and

THE DEPARTMENT OF FORESTRY, COLORADO AGRICULTURAL COLLEGE

Relative to

Cooperative White Pine Blister Rust Control Work in Colorado.

Effective July 1, 1934

----0)(0----

A. THE BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE agrees to:

(1) Pay the salaries and necessary travel expenses of one or more employees who shall conduct blister rust control work in Colorado;
(2) Generally supervise and conduct -
(a) Surveys to determine location and value of white pine and numbers and kinds of associated Ribes.
(b) To determine by field scouting whether or not white pine blister rust is present in this state.
(3) So far as possible to determine the cost of local control in the white pine type of Colorado, and to demonstrate the practical application of control practices.

B. THE DEPARTMENT OF FORESTRY, COLORADO AGRICULTURAL COLLEGE agrees to:

(1) Use its regular employees, so far as their other duties permit, in assisting the employees of the Bureau of Entomology and Plant Quarantine in the activities enumerated above;
(2) To make available to the employees of the Bureau of Entomology and Plant Quarantine all technical records available regarding location and distribution of white pine and Ribes in Colorado;
(3) To assist the employees of the Bureau of Entomology and Plant Quarantine with all possible technical advice;
(4) To provide such office space and facilities as may be necessary during the course of the field season.

C. IT IS MUTUALLY AGREED that:

(1) This memorandum may be terminated at any time by any one of the parties by written notice, and may be amended by written mutual agreement:
(2) All official records and reports of work performed under this agreement shall be open to inspection by any or all parties to this agreement, that all findings of blister rust made by any party to this agreement shall be promptly reported to all other parties to this agreement, and that all specimens collected by any party to

MEMORANDUM OF UNDERSTANDING

Between

THE BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE,

U. S. DEPARTMENT OF AGRICULTURE

and

THE STATE BOARD OF TRUSTEES, Colorado Agricultural College

Relative to

Cooperative White Pine Blister Rust Control Work in Colorado.

Effective July 1, 1924

---oOo---

1. THE BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE agrees to:

(1) Pay the salaries and necessary travel expenses of one or more employees who shall conduct blister rust control work in Colorado;

(2) Generally supervise and conduct -

(a) Surveys to determine location and value of white pine and numbers and kinds of associated Ribes.

(b) To determine by field scouting whether or not white pine blister rust is present in this state.

(3) So far as possible in determining the need of local control in the white pine type of Colorado, and to demonstrate the practical application of control practices.

2. THE DEPARTMENT OF AGRICULTURE, COLORADO AGRICULTURAL COLLEGE agrees to:

(1) Use its regular employees, so far as their other duties permit, in assisting the employees of the Bureau of Entomology and Plant Quarantine in the activities enumerated above;

(2) To make available to the employees of the Bureau of Entomology and Plant Quarantine all technical records available regarding location and distribution of white pine and Ribes in Colorado;

(3) To assist the employees of the Bureau of Entomology and Plant Quarantine with all possible technical advice;

(4) To provide such office space and facilities as may be necessary during the course of the field season.

3. IT IS MUTUALLY AGREED that:

(1) This memorandum may be terminated at any time by any one of the parties by written notice, and may be amended by written mutual agreement;

(2) All official records and reports of work performed under this agreement shall be open to inspection by any or all parties to this agreement, that all findings of blister rust made by any party to this agreement, and that all specimens collected by any party to

this agreement which are suspected of being infected with blister rust shall be submitted promptly to the Bureau of Entomology and Plant Quarantine for final determination;

(3) The results of the cooperative work may be published jointly, or upon mutual agreement by either cooperating party, due credit being given to the cooperating agencies. All manuscripts therefor shall be criticised by the cooperating parties before publication; and all form letters, bulletins and any other circulars to be mailed in penalty envelopes shall be submitted in manuscript form for approval by the Bureau of Entomology and Plant Quarantine before being printed or distributed;

(4) Obligations by the Bureau of Entomology and Plant Quarantine are contingent upon appropriations being made therefor by Congress; and no funds of the United States shall be expended in compensation for host plants destroyed in control work;

(5) For the Fiscal Year beginning July 1, 1934, the Bureau of Entomology and Plant Quarantine shall contribute in value approximately $9,000.00 to the support of this cooperative work, and the Department of Forestry of the Colorado Agricultural College shall contribute in value approximately $2,500.00; thereafter the amount to be contributed by each shall be determined and agreed upon by supplemental correspondence.

Date:	Signature:
	THE STATE BOARD OF AGRICULTURE
June 27, 1934	H. B. DYE, President
Aug. 4, 1934	LEE A. STRONG Chief, Bureau of Entomology and Plant Quarantine

WHITE PINE-RIBES SURVEY IN WYOMING AND COLORADO, 1934

by
E. L. Joy
Associate Forester

PURPOSE OF SURVEY

The purpose of such a survey as that conducted in Wyoming and Colorado by the Division of Plant Disease Control is to secure and summarize all available data regarding distribution of white pines, to supplement these data by field surveys, to determine the kinds and numbers of Ribes occurring within these white pine stands, and finally to determine by small scale experiments the cost of local control of white pine blister rust in such white pine stands. The work performed in 1934 consisted of compilation of available data and supplementary field surveys for a portion but not all of the white pine stands in these two states. Experiments to determine the cost of blister rust control have not yet been conducted. When these several types of information are secured and are summarized in concise form they will be made available to the owners of forest lands or those responsible for the management and protection of such lands. The ultimate decision as to the desirability of extending blister rust control to these lands clearly lies in the hands of such land owners or managers. In the event that local control operations are to be undertaken, the Division of Plant Disease Control will assist these land owners and managers in every possible way, such as in the development of working plans, in the development and application of technical methods of control, and in the checking of control work to determine its efficiency.

Cooperation

Since the forest resources of the Central and Southern Rocky Mountain region provide wood products, watershed protection, erosion control, wild life shelter and recreational advantages, it is apparent that the threatened loss of any large part of the timber cover is of more than local concern. Therefore, it is desirable that both governmental and private agencies evidence their interest in and lend their support to a project to determine the feasibility of protection from an introduced pest. To this end excellent cooperation was extended by the Forest Service, the National Park Service, the University of Wyoming and Colorado Agricultural College. The Forest Service and National Park Service provided maps, data on the distribution and location of white pine and made available many of their facilities. It was especially helpful that the officers and field personnel of these services displayed an interest in the project, giving it much time and thought.

The University of Wyoming and Colorado Agricultural College gave very generously of their facilities and services and entered into formal cooperative agreements with the Bureau of Entomology and Plant Quarantine. From both institutions were obtained data on the distribution of the white pines and the Ribes and other valuable technical information. Of particular value was the herbarium in the Botany Department of the University of Wyoming where very complete information on plants of the Rocky Mountain region is available.

PURPOSE OF SURVEY

The purpose of cooperation

The purpose of such a survey as that conducted in Wyoming and Colorado by the Division of Plant Diseases Control is to secure and summarize all available data regarding distribution of white pines, to supplement these data by field surveys, to determine the kinds and numbers of killers occurring within these white stands, and finally to determine by small scale estimates the cost of local control of white pine blister rust in such white pine stands. The work performed in 1934 consisted of compilation of available data and supplementary field surveys for a portion but not all of the white pine stands in these two states. Experiments to determine the most effective rust control to be used were conducted. When these several types of information are secured and summarized in concise form they will be made available to the owners of forest lands or those responsible for the management and protection of such lands. The ultimate decision as to the desirability of extending blister rust control to these lands clearly lies in the hands of each land owners or managers. In the event that local control operations are to be undertaken, a Division of Plant Diseases Control will assist these land owners and managers in every possible way, such as in the development of working plans, in the application of control methods, and in the checking of control work to determine its efficiency.

Cooperation

Since the forest resources of the Central and Southern Rocky Mountain region provide wood products, watershed protection, erosion control, wild life shelter and recreational advantages, it is apparent that the threatened loss of any large part of the timber cover is of more than local concern. Therefore, it is desirable that both governmental and private agencies share interest in and lend their support to a project to determine the feasibility of eradication from an introduced pest. To this end extensive cooperation was extended by the Forest Service, the National Park Service, the University of Wyoming and Colorado Agricultural Colleges. The Forest Service and National Park Service provided many of their facilities. It was especially helpful that the officers and field personnel of these services displayed an interest in the project, giving it much time and thought.

The University of Wyoming and Colorado Agricultural Colleges gave very generously of their facilities and services and entered into formal cooperative agreements with the Bureau of Entomology and Plant Quarantine. From both institutions were obtained data on the distribution of the white pine and other valuable technical information. Of particular value was the participation in the Botany Departments of the University of Wyoming where very complete information on plants of the Rocky Mountain region is available.

The Forestry Department of Colorado Agricultural College deserves special mention for its cooperative efforts. Through this department, office space and facilities were provided for the supervisor of the survey, and the summer camp lodge at Pingree Park, Colorado was made available for a training camp. In addition assistance was given in the matter of selecting trained personnel for the field work.

Status of the Rust in the West

The disease has been found on pines in British Columbia, Washington, Oregon, Idaho and Western Montana. It is known to be within 250 miles of northwestern Wyoming. Since some of the closest infections were started 11 years ago in 1923, and long distance spread of the disease is possible, it is not unreasonable to believe that the rust is already established on pines in Wyoming.

White Pines and Ribes of Wyoming and Colorado.

As used in this report, the Central and Southern Rocky Mountain Region includes parts of Montana, Idaho and Utah and all of Wyoming, Colorado, New Mexico and Arizona. In Wyoming and Colorado, where the largest part of the white pine of this region is found and where the survey was conducted in 1934, there are three species of white pine. These are P. flexilis which occurs in both states, P. albicaulis which is found only in northwestern Wyoming, and P. aristata which occurs on most of the forests in Colorado.

Thirteen species of Ribes were found in these states. They are: R. cereum, Douglas; R. inerbrians, Lindl.; R. lacustre, (Pers.) Poir.; R. montigenum, McClatchie; R. coloradense, Cov; R. wolfii, Rothr.; R. viscosissimum, Pursh.; R. petiolare, Dougl.; R. americanum, Mill.; R. aureum, Pursh.; R. inerme, Rydb.; R. leptanthum, A. Gray; and R. setosum. All species except R. americanum and R. aureum were found associated with the white pine.

Survey Methods

The methods adopted for this survey involve three major steps: (1) to ascertain the amount of white pine; (2) to determine the relative value of this timber, and (3) to ascertain the kinds and amounts of Ribes that it would be necessary to eradicate to afford protection to the pine.

All available data on the locations and acreages of stands of white pine were secured from the Forest Service and National Park Service. These data and additional information from forest officers familiar with each locality in question aided in the location of many of the areas of white pine. With this assistance, it was also possible to select several areas in each forest unit from which to secure samples of the white pine and Ribes populations. These samples were secured from strips 13.2 feet (.2 chain) wide that were run through each stand, the distance between strips being governed by local conditions and the amount of time that could be allotted to the stand. Since the Ribes are most abundant in the stream bottoms and other very moist sites, additional samples were taken to determine the "stream type" conditions.

The Forestry Department of Colorado Agricultural College deserves special mention for its cooperative efforts. Through this service, office space and facilities were provided for the supervisor of the survey, and the summer camp lodge at Pingree Park, Colorado, was made available for a central camp. In addition assistance was given in the matter of selecting trained personnel for the field work.

States of the Rust in the West

The disease has been found on pines in Texas, Oklahoma, New Mexico, Oregon, Idaho and Western Montana. It is known to be within 250 miles of northwestern Wyoming. Since some of the closest infections were located in parts of Colorado in 1924, and since the distance separating the two regions is considerable, it is not unreasonable to believe that the rust is already established on pines in Wyoming.

White Pines and Types of Wyoming and Colorado

As used in this report, the Central and Southern Rocky Mountain region includes parts of Montana, Idaho and Utah and all of Wyoming, Colorado, New Mexico and Arizona. In Wyoming and Colorado, where the largest part of the white pine of this region is found and where the survey was conducted in 1924, there are three species of white pine. These are *P. flexilis* which occurs in both states, *P. ponderosa* which is found only in northwestern Wyoming, and *P. aristata* which occurs on most of the forests in Colorado.

Thirteen species of ribes were found in these states. They are: *R. cereum*, Douglas; *R. inebrians*, Tind.; *R. lacustre*, (Pers.) Poir.; *R. montigenum*, McClatchie; *R. colorandense* Coville; *R. petiolare*, Nutt.; *R. rotundifolium*, Michx.; *R. pedigerum*, Dougl.; *R. setosum*, Lindl.; *R. viscosissimum*, Pursh.; *R. inebrians*, Tidestrom; *R. Hudsonianum*, Rich.; and *R. oxyacanthoides* Marshall subsp. *setosum* (Lindl.) Wor. All species except *R. montigenum* were found associated with the white pine.

Survey Methods

The methods adopted for this survey involve three main steps: (1) to ascertain the amount of white pine; (2) to determine the relative value of this timber, and (3) to ascertain the kinds and amounts of ribes that would be necessary to eradicate to afford protection to the pine.

All available data on the locations and acreages of stands of white pine were secured from the Forest Service and National Park Service. These data and additional information from Forest officers familiar with each locality in question aided in the location of many of the areas of white pine. With this assistance, it was also possible to select several areas in each forest unit from which to secure samples of the white pine and ribes populations. These samples were secured from strips 1.5 feet (.5 chain) wide that were run through each stand, the distance between strips being governed by local conditions and the amount of time that could be allotted to the stand. Since the ribes are more abundant in the extreme bottoms and other moist spots, additional samples were taken to determine the "stream type" conditions.

Results - Wyoming

Table No. 1 gives the results of the survey in Wyoming by forest units. The acreage figures, although incomplete, represent a composite of data and estimates from the Forest Service and National Park Service records, and blister rust control survey crew reports. In the column headed "No. acres with relatively high value white pine" have been inserted only acreages that we know are extant. Although it is evident that this should total more than 304,000 for the state, the full amount will not be known until the survey is completed. It is the writer's estimate that the total is between 500,000 and 700,000 acres.

TABLE NO. 1

WHITE PINE - RIBES SURVEY RESULTS, 1934
WYOMING

Forest Unit	No. Acres Supporting White Pine	No. Acres With Relatively High Value White Pine *	Ribes Per Acre Upland		Ribes Per Acre Stream Type		No. White Pines Per Acre
			No.	WLS**	No.	WLS	
Yellowstone N.P.	569,000	69,000	3	263	148	11,112	312
Grand Teton N.P.	19,000	2,000	26	1,568	139	22,077	44
Shoshone N.F.	651,000	72,000	19	1,822	59	6,645	84
Washakie N.F.	640,000	81,000	12	1,605	67	9,285	128
Shoshone I.R.	183,000	11,000	38	3,750	86	15,618	30
Teton N.F.	703,000	12,000	9	998	65	9,148	94
Wyoming N.F.	806,000	15,000	21	1,638	46	6,814	21
Medicine Bow N.F.	72,000	22,000	19	1,009	99	12,903	118
Big Horn N.F.	111,000	20,000	10	686	79	8,863	28
All Units	3,754,000	304,000	12	927	76	10,514	158

*Incomplete
**Feet of Live Stem

The Forest Area

Wyoming's forest lands aggregate approximately 15 million acres which is almost one-fourth of the area of the state. The largest part of this is within the boundaries of ten national forests, two national parks and one Indian reservation. It was in the nine largest of these units that the survey work was done.

Most of the forested area of Wyoming lies in the northwestern part of the state along the Continental Divide to the north of the high plateau which is a vast area of rolling, treeless grassland at from 6,500 to 7,000 feet elevation. The balance of the forests are located in the Big Horn Mountains in the north central part, the Medicine Bow and Laramie Mountains in the southeastern portion and the Black Hills near the northeastern corner.

Table No. 1 gives the results of the survey in Wyoming by forest units. The acreage figures, although incomplete, represent a complete or near complete figure for the Forest Service and National Park Service tracts, and digital and control survey crew records. In the column headed "No. acres with relatively high value white pine" have been inserted only acreages that we know are actual, although it is evident that this should be considerably more than 250,000 for the state, the full amount will not be known until the survey is completed. It is the writer's estimate that the total is between 600,000 and 700,000 acres.

TABLE NO. 1

WHITE PINE - BLACK RUST SURVEY RESULTS, 1934
WYOMING

Forest Unit	No. Acres Supporting White Pine	% Acres With Relatively High Value Pine *	No. Acres Infected	Infection Per Cent	No. White Pines Per Acre Stand Type	No. White Pines Per Acre
Yellowstone N.P.	500,000	80,000	3	.960	1.49	11,112	8.2
Grand Teton N.P.	18,000	3,000	20	1,000	1.00	24,000	4
Shoshone N.F.	891,000	72,000	4	1,920	08	5,646	34
Bas Bleu N.F.	840,000	84,000	12	1,800	07	8,256	132
Snowdrop N.F.	185,000	3,000	38	3,720	06	18,818	40
Teton N.F.	708,000	12,000	2	960	65	1,148	94
Arapaho N.F.	806,000	16,000	32	1,680	42	8,814	32
Medicine Bow N.F.	72,000	24,000	18	1,080	39	12,903	118
Big Horn N.F.	111,000	20,000	10	386	70	6,660	22
All Units	3,751,000	334,000	12	927	76	10,814	158

* Incomplete
**Feet of Live Stem

The Forest Area

Wyoming's forest lands aggregate approximately 16 million acres which is almost one-fourth of the area of the state. The largest part of this is within the boundaries of two national forests, two small units and one Indian reservation. It was in the state largest of these units that the survey work was done.

Most of the forested area of Wyoming lies in the northwestern part of the state along the Continental Divide to the north of the high plateau which is a vast area of rolling, treeless grassland at from 5,000 to 7,000 feet elevation. The balance of the forests are located in the Big Horn Mountains in the north central part, the Medicine Bow and Laramie Mountains in the southeastern portion and the Black Hills near the northeastern corner.

The topography of the forest lands is in general very rugged. Starting in the foothills at about 6,500 feet elevation, where the rivers and streams flow through deep cut canyons, the ascent is made through a very rough country which is topped by barren, rocky ridges and peaks. Although the highest elevation in the state (Gannett Peak) is 13,875 feet, nearly one and one-half million acres are above 10,000 feet.

Within only the national forests of Wyoming, there are over fourteen and one-half billion board feet of standing timber. Nearly 60 percent of this is lodgepole pine which grows in pure stands up to 8,000 - 9,000 feet elevation. There it gives way to Engelman spruce and alpine fir which continue on to timber line at approximately 10,500 feet.

Two other forest types of importance are (1) the Douglas fir and (2) the limber and white bark pine. Douglas fir occurs in very limited areas in the upper lodgepole and lower spruce zones. It grows in almost pure stands, nearly always on moist north slopes. Limber pine, at lower elevations, grows usually on dry, exposed, rocky sites, but toward the upper limits of tree growth, it with white bark pine, occupies the better sites and forms stands of higher quality. It is notable that white bark pine occurs only in the northwestern part of the state, reaching as far south as the Green River Lakes.

The White Pine Area

Every forest unit in Wyoming that was surveyed has areas of white pine which are considered to have a relatively high use value. The incomplete results from the survey show that at least 304,000 acres come under this classification. Undoubtedly this amount will be increased considerably by additional survey work since the total area on which white pine occurs totals over three and three-quarter million acres. This latter figure, however, includes a large acreage supporting only a few scattered trees per acre, the value of which probably never will justify control work.

Ribes Conditions

In every stand of white pine that was surveyed both upland and stream type Ribes were found. In the uplands the average number of bushes per acre ranges from 3 to 38 while in the stream type this variation is from 46 to 148 bushes. Comparing with the Ribes occurrence in north Idaho, these figures show the Wyoming areas to have only light to medium Ribes populations. On the basis of the quantity of Ribes, as measured by the number of feet of live stem in these bushes, the same comparative rating holds true.

Of considerable importance is the fact that Ribes petiolare occurs in the stream type in association with white pine, in many parts of northwestern Wyoming. This is the limit of the southeastern range of this species which is so abundant in parts of north Idaho. Because this species is a highly susceptible host of the rust - probably the most susceptible native host in Wyoming - and is very often responsible for the introduction of the disease at points that are long distances from the nearest source of aeciospores, its occurrence in the state presents a serious rust hazard. Fortunately this species can be eradicated by the use of chemicals.

The topography of the forest lands is in general very rugged. Starting in the foothills at about 6,000 feet elevation, where the rivers and streams flow through deep cut canyons, the ascent is made through a very rough country which is topped by barren, rocky ridges and peaks. Although the highest elevation in the state (Gannett Peak) is 13,670 feet, nearly one-half million acres are above 10,000 feet.

Within only the national forests of Wyoming, there are over fourteen and one-half billion board feet of standing timber. Nearly 80 percent of this is lodgepole pine which grows in pure stands up to 7,500 - 9,500 feet elevation. There is given way to Engelmann spruce and alpine fir which continue on to timber line at approximately 10,500 feet.

Two other forest types of importance are (1) the Douglas fir and (2) the limber and white bark pine. Douglas fir occurs in very limited areas in the upper lodgepole and lower spruce zones. It grows to largest pure stands, nearly always on moist north slopes. Limber pine, at lower elevations, grows usually on dry, exposed, rocky sites, but towers the upper limits of tree growth, it will write bark pine, occupies the better sites and forms stands of higher quality. It is notable that white bark pine occurs only in the northwestern part of the state, reaching as far south as the Green River Lakes.

The White Pine Area

Every forest unit in Wyoming that was surveyed has areas of white pine which are considered to have a relatively high use value. The incomplete results from the survey show that at least 500,000 acres come under this classification. Undoubtedly this amount will be increased considerably by additional survey work since the total area on which white pine occurs totals over three and three-quarter million acres. This latter figure, however, includes a large acreage supporting only a few scattered trees per acre, the value of which probably never will justify control work.

Tribe Conditions

In every stand of white pine that was surveyed both climax and stream tribes were found. In the regions the average number of brakes per acre ranges from 2 to 35 while in the stream type this variation is from 45 to 140 brakes. Comparing with the tribes occurrence in north Idaho, these figures show the Wyoming areas to have only light to medium tribe populations. On the basis of the quantity of Ribes, as measured by the number of feet of live stem in these brakes, the same comparative rating holds true.

Of considerable importance is the fact that Ribes petiolare occurs in the stream type in association with white pine, in many parts of northwestern Wyoming. This is the limit of the northwestern range of this species which is so abundant in parts of north Idaho. Because this species is a highly susceptible host of the rust - probably the most susceptible native host in Wyoming - and is very often responsible for the introduction of the disease at points that are long distance from the nearest source of reinfection, its occurrence in the state presents a serious rust hazard. Fortunately this species can be eradicated by the use of chemicals.

The Forest Units

Included in the survey in Wyoming are six national forests, two national parks and one Indian reservation. In addition, the timbered areas outside the boundaries of these units were given as much consideration as time would permit. No work was done on the small portions in Wyoming of four national forests that lie, for the most part, in adjacent states.

A brief discussion of each of the units surveyed follows:

Yellowstone National Park. Yellowstone National Park is the largest and probably the best known of our national parks. Thousands of tourists visit the park each year being drawn by its large number of geysers and other hot water phenomena. Yellowstone Canyon, Yellowstone Falls, the abundance of wild live and many other attractions. All of these are either dependent upon or greatly enhanced by the forests which cover almost the entire park area.

Of the total area of 2,200,240 acres, over two million acres are in Wyoming. The predominant tree throughout is lodgepole pine which occurs in greatest abundance at the low and middle altitudes. It has been estimated that three-fourths of the forest of the park is composed of this species.

Two species of white pine, namely limber pine and white bark pine, grow in the park. Limber pine, of which there is only a small amount, grows at the low and middle elevations mainly on dry, rocky sites. White bark pine occurs in scattered stands throughout the park at the middle and high elevations, extending up to timber line. Many of these stands are nearly pure white pine but there is much intermingling with other conifers. Of considerable importance is the fact that abundant white pine reproduction was found to occur under stands of lodgepole pine on several areas. This indicates the possibility of white pine eventually replacing the lodgepole pine on these areas.

It is estimated that about 569,000 acres of the park forest support white pine. The National Park Service survey, completed for about two-thirds of the park, shows 69,000 acres as pure or mixed white pine type. Surveys of several of the mapped stands show that they form an important part of the total forest cover. Large acreages of important stands will be added when a survey of the unworked eastern portion is completed.

With only a small number of Ribes per acre in the uplands and light to medium concentrations of bushes in the stream type of only part of the streams, quantity of Ribes alone would not present a serious control problem. The major difficulties that would be encountered are: (1) the relative inaccessibility of much of the area and (2) ruggedness of the country.

The stands of white pine in Yellowstone National Park have three types of value, namely aesthetic, watershed protection and erosion prevention. As far as local use is concerned, probably the aesthetic value is greatest, but to the surrounding country the other values are paramount. For the purpose of this

survey it is sufficient to know that the total value is relatively high. Appreciation of this value is greatly enhanced by knowledge of the fact that if the white pine is killed, replacement by other timber would not occur on many of the rugged, exposed sites occupied by these trees.

Grand Teton National Park. About 11 miles south of Yellowstone National Park is Grand Teton National Park with an area of about 96,000 acres. Although white pine occurs on approximately 17,000 acres of this unit, only about 2,000 acres support stands with a comparatively high use value. On this area there are more Ribes per acre than there are on the areas in Yellowstone National Park but the general conditions in the two parks are sufficiently similar to make further discussion unnecessary.

Shoshone National Forest. The Shoshone National Forest, which lies on the east slope of the Absaroka Range just east of Yellowstone National Park, contains over one and one-half million acres. Although several roads cross or extend into this forest, much of the area is comparatively inaccessible and rugged. Because of this fact only a small amount of the timber has been utilized.

Since the headwaters of the Shoshone, the Greybull and the Clarks Fork of the Yellowstone Rivers are within the boundaries of this forest, it is apparent that the timber is important for its protection of watersheds. The stands of white pine, principally limber pine, constitute an important part of this protective cover. Over 650,000 acres support white pine of which at least 72,000 acres have relatively high value. As in Yellowstone National Park, the remoteness and ruggedness of much of the area would be major difficulties in Ribes eradication work.

Washakie National Forest. Washakie National Forest, the smallest of the national forests entirely in Wyoming, contains about 860,000 acres. It is situated on the eastern slope of the mountains from the Continental Divide to the plains, and extends for over 100 miles south from the Shoshone National Forest. The southern end of the forest marks the southward limit of forest growth along the Continental Divide until just before it crosses the Wyoming-Colorado line. The intervening area is the high plateau of which the Great Divide Basin is a part.

Except for the drier, southern portion, the greater part of this forest is well covered with timber, most of which is lodgepole pine. However, white pine grows on nearly three-fourths of the area and occurs in pure or nearly pure stands on approximately one-tenth of the area. It is on this forest and on the adjacent Shoshone National Forest that large areas of mature white pine timber are located. Tie operations have already removed large amounts of white pine, lodgepole pine and Douglas fir from which excellent railroad ties are produced. Therefore these stands have commercial timber value as well as watershed protection, erosion prevention and recreational use values.

The Ribes population in the stands of white pine is generally scattered with an average of about 12 bushes per acre in the uplands and 67 in the stream type. In the closed stands of mature timber, such as that near Togwotee Pass, only a few bushes per acre are found in the uplands and very few if any in the stream type. Since R. montigenum, a very tolerant species, is most abundant and other species of Ribes grow on adjacent areas, it is evident that some shading out

of other Ribes species has occurred in the mature stands. The healthy appearance of the matted and spreading R. montigenum growing in shade indicates that this species will continue to flourish under mature timber.

Shoshone Indian Reservation. With one corner extending up the eastern slope to the Continental Divide and thus cutting the Washakie National Forest into two divisions, the Shoshone Indian Reservation contains some forested land. It is estimated that 183,000 acres of the reservation support various amounts of white pine. At least 11,000 acres of this have been classified as relatively high value forest. The balance has been eliminated because of the scattered occurrence of the trees.

Most of the reservation forest land, like the adjacent parts of the Washakie National Forest, is much drier than comparable areas farther north. Because of this fact there is a sparse timber cover. With this condition the Ribes in both the uplands and stream type are in general more abundant. This is brought out in the survey data which show that of all units surveyed, this one has the greatest upland and second greatest stream type Ribes-live-stem count per acre. It is also notable that this count resulted from only three species of Ribes, namely, R. cereum, R. setosum and R. inerme. In spite of these facts, however, the Shoshone Indian Reservation would not differ greatly from the other units in the matter of Ribes eradication difficulty.

Teton National Forest. The Teton National Forest is the largest national forest in Wyoming, having an area of 1,880,812 acres. It occupies the mountainous country for about 80 miles south of Yellowstone National Park, extending west from the Continental Divide to the summit of the Teton Mountains. Within but not included in the forest are Grand Teton National Park and Jackson Hole. The Snake River, which heads in Yellowstone National Park, runs southward through the western portion of the forest and Jackson Hole, receiving water from every stream in the forest.

In general, the mountains of this forest are neither extremely high nor rough but they are heavily timbered, mostly with lodgepole pine. On over 700,000 acres, especially at the middle and higher elevations, there is white pine in various amounts. At least 12,000 acres support stands of pure or nearly pure white pine that were recorded as having relatively high value.

The upland Ribes are quite scattered and those in stream type only average in abundance. No special eradication problem is evident.

Wyoming National Forest. South of the Teton National Forest is the Wyoming National Forest comprising two divisions which total 1,667,549 acres. The eastern division includes the slopes westward from the Continental Divide and the Washakie National Forest and the western division straddles the Salt River Range. Between is the broad, sagebrush-covered Green River Valley. Like the Washakie National Forest, the southern extremities of the divisions of this forest mark the transition from timbered to treeless country.

Although lodgepole pine is again the predominant species of timber, it is estimated that about 800,000 acres support white pine, of which at least

Most of the reservation forest land, like the adjacent parts of the Angeles National Forest, is much drier than coastal areas farther north. Because of this fact there is a sparse timber cover. Also this condition is false in both the upland and stream type are in general very similar. This is brought out in the survey data which show that of all types surveyed, pine are the greatest upland and second greatest stream type timber-bearing. It is also notable that this small peninsula type only three species of pines, namely, P. ponderosa, P. sabiana and P. jeffreyi. In spite of their local, however, the Shoshone Indian Reservation really is quite plentifully free the other major of these species.

Type-Natural Forest. The Yavin National Forest is the largest portion forest in Tyrone, having on area of 1,781,000 acres. It contains the mountains country for about 80 miles to the southeast of Yavin. Within but not included the Continental Divide to the summit of the Teton Mountains. The Snake River, which rises in Jefferson Park, runs northward through the western portion of the Forest and Jackson Hole, receiving many clear rapid streams in the forest.

In general, the mountains of this forest are neither extremely high nor rough but they are mostly timbered nearly with long gentle slope. On over 200,000 acres, especially of the middle and higher elevations, there is quite close to various amounts. At least 10,000 acres or more of nearly pure pole timber that were restored as having relatively high value.

The Jackson River are quite scenic and there is attractive hunting in them. No special erosion problem is evident.

Tyrone National Forest. South of the Teton National Forest is the Tyrone National Forest comprising two districts which total 1,897,000 acres. The western division includes the slopes westward from the Continental Divide and the Bangkie National Forest and the western drainage. Between is the broad, sagebrush-covered Green River Valley. Like the Bangkie National Forest, the southern extremities of the district are the least rugged and the transition from timbered to treeless country.

Although inaccessible when it meets the Continental portion of the [illegible] is estimated that about 2,000,000 acres support [illegible]

19,000 acres have stands of importance. Both divisions of the forest contain some of the stands included in this acreage.

On this forest the Ribes population approximates that on the adjacent Washakie and Teton National Forests. Ruggedness of country in the eastern division, which is an extension of similar topography on the Washakie National Forest, would make working conditions there somewhat more difficult than in the western portion.

Medicine Bow National Forest. In the south central part of the state, below the treeless high plateau, rugged and timbered mountains again mark the Continental Divide. To the east, separated from this range and from each other, are the Medicine Bow and Laramie Mountains. Parts of each of these three ranges are included in the three divisions of the Medicine Bow National Forest which has an area of 879,035 acres.

It is estimated that 72,000 acres of this forest support white pine. At least 22,000 acres of this, a large part of which is in the Pole Mountain or eastern division have stands that provide a valuable cover crop. The location in this eastern division of the Pole Mountain Forest Nursery, the Fort Warren Target and Maneuver Grounds and a section of the Lincoln Highway suggest that the stands of limber pine in this unit of the Medicine Bow National Forest are quite important.

Only three species of Ribes, R. cereum, R. inerme and R. lacustre, were found in association with the limber pine on the Medicine Bow National Forest. The principal eradication problem will be the removal of R. inerme from the stream type. Several drainages have moderate amounts of this species.

Big Horn National Forest. In north central Wyoming, south of the Crow Indian Reservation in Montana and across the Big Horn Valley from the Shoshone National Forest is the Big Horn National Forest. It includes practically all of the Big Horn Mountains, a district range which rises from the plains about 100 miles east of the Absaroka Range. Although there are several roads that penetrate or cross the forest, much of the 80-mile long unit is rugged and not readily acces - sible. This is especially true of the central portion which is administered as a "primitive area"..

The Big Horn National Forest contains over one and one-quarter million acres. The survey shows that about 111,000 acres support white pine with about 20,000 acres of this having stands with a high protective value. These stands are distributed throughout the forest and are valuable chiefly for watershed protection and erosion prevention.

Since the upland Ribes occur at an average of only 10 per acre and stream type Ribes average 79 per acre, the removal of these host plants does not present a difficult problem. It is apparent, however, that since many of the work camps would have to be located in rugged back country, relative inaccessibility of areas would be of most concern.



White-bark pine (P. albicaulis) Sylvan Pass, Yellowstone National Park, Wyoming.



Limber pine (P. flexilis) and Douglas fir, Bighorn National Forest, Wyoming

Annual Report 1934
E. L. Joy

RESULTS - COLORADO

In Table No. 2 are shown the results of the survey in Colorado. The acreage figures given are incomplete but represent the total compiled from Forest Service and National Park Service records and the blister rust control survey data. As mentioned in connection with the Wyoming data, the acreages of relatively high value white pine are low since they represent only the known amounts. In all probability the completed survey will reveal a total of approximately 500,000 acres in Colorado. In a similar manner the gross area supporting white pine will be increased.

TABLE NO. 2

WHITE PINE BLISTER SURVEY RESULTS, 1934
COLORADO

Forest Unit	No. Acres Supporting White Pine	No. Acres With Relatively High Value White Pine	Ribes Per Acre Upland		Ribes Per Acre Stream Type		No. White Pines Per Acre
			No.	F.L.S.	No.	F.L.S.	
Roosevelt N.F.	24,000	4,000	4	242	83	7,227	24
Rocky Mt. N.P.	15,000	7,000	1	60	68	6,040	72
Pike N.F.	360,000	160,000	12	1,356	95	39,192	138
Cochetopa N.F.	24,000	14,000	12	2,712	18	2,952	120
Gunnison N.F.	3,000	2,000	15	1,596	279	42,384	42
Rio Grande N.F.	80,000	11,000	25	3,851	23	1,704	142
San Isabel N.F.	28,000	8,000	11	2,712	94	14,192	226
All Units	550,000	206,000	7	804	68	8,856	83

The Forest Area

The forests of Colorado cover about sixteen and one-half million acres or one-fourth of the area of the state. Most of the forested land lies in the western half of the state adjacent to the Continental Divide or along the secondary mountain ranges. A total of over thirteen million acres of this area is within the boundaries of 14 national forests and one national park. On only the national forest area there is nearly 39 billion board feet of timber.

The topography of the forest land is varied, ranging from high, rolling plateaus to extremely rugged and precipitous slopes. Above the timber of the slopes rise the massive, barren peaks many of which have elevations over 14,000 feet. The large number of these in Colorado give it the distinction of having more peaks over 14,000 feet elevation then there are in all other states combined.

Colorado contains about one percent of the nation's timber in forests that are capable of producing a yearly increment in excess of the amount needed by the people of the state. The commercially important conifers that make this contribution are Engelmann spruce, alpine fir, western yellow pine, Douglas fir, lodgepole pine, limber pine, bristlecone pine, juniper and pinon pine. Aspen, which

Forest, Rocky Mountain National Park, Pike, Gunnison, Cochetopa, San Isabel and Rio Grande National Forests.

ARIZONA - COLORADO

In Table No. 2 are shown the results of the survey in Colorado. The

be increased.

TABLE NO. 2

COLORADO

Forest Unit	No. Acres Supporting White Pine	No. Acres With Relatively High Value	Ribes Per Acre	Ribes Per Acre	No. White Pine
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The Forest Area

The forests of Colorado cover about sixteen and one-half million acres

Colorado contains about one percent of the nation's timber in forests

is used in the manufacture of excelsior and boxes, is the only broad-leaf tree with commercial value and this has been exploited very little to date.

Lodgepole pine, the principal species in Wyoming, occurs as far south in Colorado as the San Isabel National Forest but is most important commercially on the forests in the northern half of the state. This species and western yellow pine occupy the drier low and middle elevations. Starting at the middle elevations and extending to timber line are Engelmann spruce and alpine fir which make extensive forests on all slopes and aspects. Intermingled at the middle elevations is Douglas fir. Chiefly on the dry, exposed slopes and ridges at the middle and high elevations will be found limber pine and bristlecone pine, two species of white pine. Occasionally these species will occupy better sites which produce a higher grade of timber. Generally the trees of these species do not attain any great size and therefore have very little commercial value except in local use. However, they form an important part of the cover so necessary for watershed protection and erosion prevention due to their tendencies to occupy the extremely unfavorable, thin soiled and rocky sites.

The White Pine Area.

Of the 15 forest units considered in this survey at least 7 have comparatively important areas of white pine. The other 8 have small stands or patches of scattered trees or none. The survey data show a total of 206,000 acres in the stands that have a relatively high value. It is estimated that the total area which should fall under this classification amounts to about 500,000 acres.

Ribes Conditions

Light to medium concentrations of Ribes were encountered throughout most of the white pine areas that were sampled. In the uplands the occurrence ranges from one to 25 bushes per acre while the stream type has from 29 to 279. The heaviest concentrations were found on the Gunnison National Forest where Ribes in the stream type average over 42,000 feet of live stem per acre. This represents by far the heaviest Ribes growth associated with white pine encountered in either Colorado or Wyoming.

Six species of Ribes, R. inerme, R. lacustre, R. cereum, R. montigenum, R. coloradense and R. leptanthum, were found associated with the white pine. The first three are the most abundant, with R. montigenum occurring in quite large quantities on restricted areas at high altitudes. The other two occur only occasionally.

The Forest Units

The largest part of the white pine is on the slopes east of the Continental Divide or high up on the western slope. Five of the six national forests and the one national park that were found to have the bulk of the white pine, lie immediately adjacent to the divide while the sixth forest, the San Isabel, follows lateral ranges on the east side. From the Wyoming line on the north to the New Mexico line on the south, these units are the Roosevelt National Forest, Rocky Mountain National Park, Pike, Gunnison, Cochetopa, San Isabel and Rio Grande National Forests.

Roosevelt National Forest. Including nearly 895,000 acres which cover about 80 miles of the eastern slope of the front range of the Rocky Mountains from the Wyoming-Colorado line south, the Roosevelt National Forest is adjacent to one of the most fertile agricultural sections of Colorado. This section lies in the valleys of the South Platte River and its tributaries, the Cache la Poudre and Big Thompson Rivers and St. Vrain and Boulder Creeks, all of which derive water from this forest. Approximately one-third of the irrigated land in the state is within the valleys of these streams.

In the northern end of the Roosevelt National Forest are extensive stands of lodgepole pine which are a continuation of similar stands on the Medicine Bow National Forest in Wyoming. This timber is being cut chiefly for railroad ties. Other timber types of importance on the Roosevelt are western yellow pine, Engelmann spruce, Douglas fir, alpine fir, limber pine and cedar. Limber pine occurs in scattered patches or small stands throughout the higher altitudes of the forest. It is estimated that 24,000 acres of the forest support this species. Survey work on only part of the forest revealed 4,000 acres in stands that have protective cover value.

Within the limber pine areas the Ribes are relatively light in abundance. An average of only four bushes per acre was found in the uplands while 93 bushes per acre with about 7,000 feet of live stem were found in the stream type. The species found are R. cereum in the uplands and R. inerme, R. lacustre, R. montigenum and R. coloradense in the stream type.

Rocky Mountain National Park. Almost surrounded by the Roosevelt National Forest which borders on the northwest, north, east and south, Rocky Mountain National Park includes one of the most rugged groups of mountains in Colorado. Its area of 259,411 acres includes 56 named mountains over 10,000 feet elevation, of which the highest is Long's Peak with an elevation of 14,255 feet. This park is the mecca of the summer vacationists of the East and Middle West.

Although the more precipitous eastern slope of the Continental Divide, which runs through the park, has indications of barrenness when seen from the valley at the foot of the range, closer observations reveal timber cover below 10,500 feet elevation on most of the slopes. This timber includes the same species that were found on the Roosevelt National Forest.

Limber pine is found on the rocky sites in the middle and high elevations to timber line. It occurs in a belt of pure or nearly pure stands of fair sized trees at the lower edge of the higher elevations and mixed with other species both below and above this belt. The trees that mark timber line are shrubby and deformed from the sweeping winds, in which condition they form valuable "breaks" over which snow accumulates in deep drifts. These mats of deformed trees are important agencies in the protection of watersheds by timber cover.

The survey data show that of approximately 15,000 acres in the park that support white pine, 7,000 acres have stands with considerable value for watershed protection and for scenic and recreational use. The principal stands included in the survey are (1) Long's Peak, which extends from Estes Cone to Keeker Ridge,

(2) Wild Basin, in the southeastern corner of the park, along the ridge between Cony, St. Vrain and Rock Creeks, and (3) Hidden Valley, which lies along the Trail Ridge road above Hidden Valley Creek.

On each of the areas the Ribes are very scattered in the uplands and light to medium in abundance in stream type. The predominant species in the uplands is R. cereum while R. lacustre, R. coloradense, R. montigenum and R. inerme constitute the stream type Ribes. No difficult problem of Ribes eradication would be encountered on the park areas.

Pike National Forest. Occupying over a million acres of land stretching for 80 miles south of the Roosevelt National Forest on the east side of the divide, the Pike National Forest is one of the most important forests in the state. Its chief values lie in the water, which is used to supply Denver, Colorado Springs and many smaller cities along the foothills, and the recreational advantages afforded residents of these centers of population nearby as well as others more distant. The timber values, which are evident in the present stands of mature timber, are only a small part of the values before fires and railroad and mine development drew heavily on the original supply. This burning and cutting necessitated careful management of the remaining stands and an intensive planting program for the denuded areas. The latter has been carried on continuously for about 30 years and has resulted in some excellent stands of western yellow pine, limber pine, Engelmann spruce and Douglas fir.

The Pike National Forest is the northernmost forest in Colorado on which P. aristata or bristlecone pine is found. This species with limber pine, occurs on a total of 360,000 acres of this forest and constitutes an important part of the watershed cover. The survey shows that at least 160,000 acres support pure or nearly pure stands with comparatively high values. Of special importance are the stands in the vicinity of Pike's Peak, Mt. Herman, Tarryall, Fairplay and Jefferson, some of which contain areas of reproduction.

Within the areas of white pine an average of 12 Ribes per acre grow in the uplands and 95 per acre in the stream type. The species are R. cereum and R. montigenum on the slopes and R. inerme along the streams. The latter, which occurs at the average rate of 29,192 feet of live stem per acre, presents the greatest eradication difficulties due to its habit of intermingling with willows and other moist-site brush.

Cochetopa National Forest. The Cochetopa National Forest, lying west and southwest of the Pike National Forest and mostly along the east side of the divide, contains over 900,000 acres in a narrow strip approximately 100 miles long. The northern part is characteristically mountainous, containing several of the highest peaks in the state. One of these is Mt. Elbert, 14,420 feet high, which is the highest peak in the Rocky Mountain chain between Canada and Mexico and the second highest peak in the United States. Toward the southern part of the forest the country is more rolling although still high in altitude. Three major rivers, the Arkansas, Rio Grande del Norte and Colorado, receive water from this forest, the Arkansas originating in the extreme northern part near Leadville.

The principal timber species on the Cochetopa National Forest are the same as found on the forests farther north. Both limber pine and bristlecone pine

are present, occupying the more exposed and rugged sites both in pure and mixed stands. About 34,000 acres support these species in varying amounts with at least 14,000 acres having pure or nearly pure stands. The latter are relatively important for protection of watersheds and prevention of erosion.

Only R. cereum, R. montigenum and R. inerme were found associated with the white pine, the first two in the uplands and the third in the stream type. It is interesting to note that the average occurrence of Ribes bushes in the stands of white pine is the same in uplands as in stream type, there being 18 bushes per acre. This can be accounted for by the fact that the bulk of the white pine that was found lies in the southern part of the forest where drier conditions prevail and moist stream-bottom Ribes sites are less plentiful.

Gunnison National Forest. West of the Cochetopa National Forest and entirely on the western side of the divide is the Gunnison National Forest. This forest, which is approximately the same size as the Cochetopa, is divided into two divisions which are separated by the fertile valleys of the Gunnison River and its tributaries. Adjacent to the valleys the slope of the forest land is gentle and rolling but toward the interior and on to the north and east boundaries the topography is very rough.

The chief timber species on this forest are Engelmann spruce, alpine fir, western yellow pine and Douglas fir. Lodgepole pine is found on part of the forest which marks the southern limit of the range of this species on the western slope of the Rocky Mountains.

Only about 3,000 acres supporting limber pine and bristlecone pine are recorded for this forest. Of this amount 2,000 acres are classed as supporting relatively high value protection forest. This acreage occurs in small stands chiefly in the Ceballo and Taylor Park districts.

Apparently the more moist conditions that prevail on the western slope are responsible for the larger amounts of stream type Ribes that occur on the Gunnison. The survey data show an average of 279 bushes per acre with 42,384 feet of live stem in this type. R. inerme, R. coloradense, R. montigenum and R. lacustre are the major species. The uplands, with R. cereum, have only the usual small numbers of bushes.

Rio Grande National Forest. The Rio Grande National Forest which contains over a million acres of the eastern slope from the Cochetopa National Forest south to the New Mexico line, is the southernmost forest in the state. Although only about 75 air line miles in length from north to south, its western boundary, which is the Continental Divide, twists and bends for about twice this distance. A large part of the forest, in which lie the headwaters of the Rio Grande del Norte River, can be reached only by trail, even though three highways cross from east to west.

The principal timber species on the Rio Grande National Forest are Engelmann spruce, alpine fir, white fir, western yellow pine and Douglas fir. Lodgepole pine does not occur on this forest.

Both limber and bristlecone pine, important chiefly for the protection to watersheds and prevention of erosion, where found throughout the length of the forest. The survey data show a total of 86,000 acres supporting varying amounts of these white pines with at least 11,000 acres of this including stands with relatively high protective value. Most of these stands occupy rocky and dry sites such as the ridge south of Boot Mountain in the northeastern corner of the forest and the rim rock above the Conejos River in the southern part.

Ribes conditions on the Rio Grande and the Cochetopa National Forests are similar in that the average number of Ribes bushes per acre in the stream type and in the uplands is about the same. However, the average amount of live stem per acre along the streams of the former is less than the average amount found along the streams of the latter or in the uplands of either forest. Here again the general dryness of this southern part of the state's forest land is indicated by the scarcity of the moist-site Ribes. On the other hand the conditions in the uplands appear to be favorable for the growth of hillside species, chief of which is R. cereum.

San Isabel National Forest. The San Isabel National Forest is the smallest national forest in Colorado. Its three divisions, with a total area of about 000,000 acres, occupy the Sangre de Cristo Range, Wet Mountains and Culebra Range which lie east of the Cochetopa and Rio Grande National Forests. Although separated from these forests by the broad San Luis Valley and from each other by the Wet Mountain Valley, the three units contain some of the most rugged topography in the state and include several peaks over 14,000 feet elevation. With the exception of the western slope of the Sangre de Cristo Range, all of the forest is drained by the Arkansas River and its tributaries.

The timber of the San Isabel consists chiefly of Engelmann spruce, Douglas fir, white fir, limber pine, lodgepole pine and western yellow pine. Lodgepole pine reaches the southern limit of its range in the Rocky Mountain chain on this forest. Most of the timber cut is converted into ties and mine props although fence posts and fuel wood for local use are supplied in large quantities.

One or both species of white pine of the state are found in parts of all three divisions of the forest. Scattered trees, in mixture with the other conifers, is the usual occurrence with occasional stands of nearly pure white pine on the more rugged sites. The survey shows about 23,000 acres with varying amounts of white pine with at least 8,000 acres supporting the most important stands.

Although the limber and bristlecone pines are cut with other species for ties, props, posts and fuel wood, their greatest value lies in the protection of watersheds and prevention of soil erosion. Where the trees are scattered throughout stands consisting chiefly of other species, as is the case on a large part of this forest, it is doubtful that the white pines can be regarded as possessing great cover crop value in view of the fact that they could be replaced by other species. However, the nearly pure stands must be regarded in a different light since they occupy the sites that are peculiarly conducive to the development of only the two species of white pine.

In general, the Ribes associated with the stands of white pine on the San Isabel National Forest occur in comparatively small numbers per acre in both

Both timber and bristlecone pine, important chiefly for the protection
[illegible] watersheds and [illegible] prevention of erosion, where found [illegible] the length of the
forest. The survey data show a total of [illegible],000 acres supporting varying amounts
of these white pines with [illegible],000 acres of this including ponderosa pine with
relatively high productive value. Most of these stands occupy east and [illegible] slopes
such as the ridge south of Zuni Mountain in the northeastern district of the forest
and the rim rock above the Canyon River in the southern part.

Other conditions on the Pike Grande and the Cochetopa National Forests
are similar in both the average number of these species in the mixed type
and in the volume in board feet. However, the average number of live trees
per acre along the streams of the former is less than the existing number
along the streams of the latter or in the volume of white fir. Here again
the general dryness of this southern part of the state's forest land is indicated
by the scarcity of the more-site trees. On the other hand the conditions in this
locality appear to be favorable for the growth of timber objects, chief of which
is R. [illegible].

[illegible] Parked National Forests. The San Isabel National Forest is the small-
est national forest in Colorado. Its three distinct, with a total area of about
[illegible],000 acres, occupy the Sangre de Cristo Range, Wet Mountains and Culebra Range
which lie east of the Cochetopa and Sig Grande National Forests. Although separ-
ated from these forests by the broad San Luis Valley and from each other by the
Wet Mountain Valley, the three units contain some of the most rugged mountainous
in the state, and include several peaks over 14,000 feet elevation. With the
exception of the western slope of the Sangre de Cristo Range, all of the forest
is drained by the Arkansas River and its tributaries.

The timber of the San Isabel Forests consists chiefly of Engelmann spruce,
[illegible] fir, white fir, limber pine, Douglas fir and western yellow pine.
Subalpine pine reaches the southern limit of its range in the Sangre de Cristo mountain
chain in this forest. Most of the timber cut is converted into ties and mine props
although fence posts and [illegible] wood for local use are supplied in large quantities.

One or both species of white pine of the state are found in nearly all
three divisions of the forest. Scattered trees, in mixture with the other coni-
fers, is the usual occurrence with occasional stands of nearly pure white pine on
the more rugged slopes. The survey shows about [illegible],000 acres with varying amounts
of white pine with at least [illegible],000 acres supporting the most important stands.

Although the limber and bristlecone pines are cut with these species for
ties, posts, poles and fuel wood, their greatest value lies in the protection of
watersheds and prevention of soil erosion. Where the trees are scattered among-
the stands annually utilizing other species, as in the case on a large part of
the forest, it is doubtful that the white pines can be regarded as possessing
[illegible] crop value in view of the fact that they could be replaced by other
species. However, the nearly pure stands must be regarded in a different light
since they occupy the sites that are peculiarly conducive to the development of
only the two species of white pine.

In general, the sites associated with the stands of white pine on the
San Isabel National Forest occur in comparatively small quantity and [illegible] be [illegible]



Limber pine (P. flexilis) and bristlecone pine (P. aristata), Pike National Forest, Colorado.



Bristlecone pine (P. aristata) reproduction under aspen, Pike National Forest, Colorado

Annual Report 1934
E. L. Joy

the uplands and along the streams. An interesting exception is found in a stand of P. aristata between Chaparal Creek and a fork of Cuchara Creek on the Spanish Peaks division of the forest. There the moist condition at the headwaters of small streams provides an ideal Ribes site on which R. montigenum and R. coloradense grow at the rate of 119 bushes with 32,000 feet of live stem per acre. By way of comparison, another stand of the same species of white pine, located approximately five miles due west of the first stand, has the same associated Ribes species at the rate of only 16 bushes and 3,850 feet of live stem per acre.

CONTROL COSTS

Those charged with the management and protection of the forest lands in the Central and Southern Rocky Mountain Region will need to know the cost of eradicating Ribes from stands of white pine before they can make final decisions on the advisability of inaugurating blister rust control measures. Since cost data for the region are not yet available, it appears advisable to give the best estimate possible based on experience in another region. For this purpose the Ribes eradication cost data from the control operations in the Inland Empire western white pine have been studied.

The equipment required for Ribes eradication work consists chiefly of the camp outfits for feeding and sheltering men. Most of this is used for several years which reduces the annual equipment charges to a relatively low amount. Therefore, the bulk of the control costs are for labor. Since the wage scales vary from year to year this item can not be predicted in advance but past experience, exclusive of emergency conservation work by the Civilian Conservation Corps, has shown that the man-day cost for this work is about $6.00. This includes all items except the cost of technical supervision provided by the Division of Plant Disease Control.

The Ribes eradication data secured in the Inland Empire during the years 1931-1933 have been summarized to show the average number of man days per acre required to eradicate various numbers of Ribes per acre from the different forest types. Since conditions affecting Ribes eradication, such as topography, brush density, climate, etc., vary greatly between regions, it does not appear logical to use the Inland Empire data by type but to use the average for all upland types and the average for stream type. On this basis, the following tabulation shows the minimum, maximum and average cost per acre for eradicating various numbers of Ribes.

TABLE NO. 3

COST PER ACRE TO ERADICATE VARIOUS NUMBERS OF RIBES PER ACRE FROM ALL UPLAND TYPES AND FROM STREAM TYPE IN THE INLAND EMPIRE WHITE PINE BELT (Computed on $6.00 man-day cost)

Number of Ribes per acre	Cost per acre-All Upland Types			Cost per acre-Stream Type		
	Min.	Max.	Av.	Min.	Max.	Av.
0-25	$ 0.24	$ 1.80	$ 0.72	$ 1.32	$ 1.80	$ 1.56
26-50	0.90	2.28	1.68	1.86	2.46	2.16
51-100	0.84	3.90	2.10	2.46	2.88	2.67
101-200	1.38	4.62	3.30	3.24	3.84	3.54
201-400	2.04	7.38	4.68	4.38	4.74	4.56
401-800	$ 3.96	$17.58	$ 7.08	$ 8.40	$15.30	$11.88

Referring to the summary of field data from which Tables Nos. 1 and 2 were derived, it is seen that Ribes were found in the uplands within stands of white pine at the rate of from 1 to 73 bushes per acre with an average of 7 bushes per acre in Colorado areas and 12 bushes per acre in those of Wyoming. Table No. 3 indicates that the cost of eradicating these numbers of Ribes from areas in the Inland Empire ranges from $0.24 to $3.90 per acre with an average of approximately $0.72 per acre.

Stream type Ribes, it is noted, are present at the rate of from 12 to 491 bushes per acre with state averages of 68 and 76 bushes per acre. To eradicate these amounts has cost from $1.32 to $15.30 per acre with an average of $2.67 per acre.

It is believed that the per acre cost of eradicating Ribes in the Central and Southern Rocky Mountain Region will be slightly higher than in the Inland Empire even though there are on the average fewer bushes per acre in both the uplands and the stream type. Some of the conditions that it is thought will cause this increase are ruggedness and steepness at high altitudes of the majority of the white pine areas, the occurrence of the stands in relatively small units and the remoteness of many of the areas. These factors, however, do not appear as handicaps that are sufficiently serious to cause any very great difference between the average costsin the two regions.

[illegible] (Expressed on [illegible] man-day cost)

Number of Miles per acre	Crew per acre-all Plant Items		Crew per acre-Plant Item	
	min.	Max.	Av.	min.	Max.	Av.
0-50	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
50-80	0.80	2.00	1.88	0.40	1.00	[illegible]
81-100	0.44	3.20	2.10	2.46	2.80	[illegible]
101-200	1.28	4.48	3.32	2.64	4.48	[illegible]
201-400	2.08	7.28	5.28	4.32	6.72	[illegible]
401-800	3 5.56	8[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Referring to the summary of field data from which Tables Nos. 1 and 2 were derived, it is seen that Mules were found on the relative white stocks of cattle pits at the rate of from 1 to 72 bushes, as compared with an average of 7 bushes per acre in Colorado where one 12 bushes per acre is taken of typical. Table No. 2 indicates that the cost of eradicating these numbers of Mules from areas in the Upland Desire Ranges from $0.72 to $2.00 per acre with an average of approximately $0.72 per acre.

Stream type Mules, it is noted, are present at the rate of from 12 to [illegible] Quadra per acre with cattle densities of 52 and 72 bushes per acre. To eradicate these amounts they cost from $1.52 to $1.80 per acre with an average of $1.67 per acre.

It is believed that the per acre cost of eradicating Mules in the Central and Southern Rocky Mountain Region will be slightly higher than in the Indian [illegible] even though there are on the [illegible] fewer bushes per acre to deal with the Arizona and the stream type. Some of the conditions that it is thought will cause the increase are ruggedness and steepness of high altitudes of the majority of the pits [illegible] pine areas, the occurrence of the stands in relatively small units [illegible] of many of the areas. These factors, however, do not [illegible] conditions that are sufficiently serious to cause any very great difference between the average costs in the two regions.

The following tabulation shows the costs of the work in Colorado and Wyoming for 1934.

TABLE NO. 4

COLORADO AND WYOMING COSTS
1934

Item	Wyoming	Colorado	Total
Salaries, Permanent Men	$2,158.91	$1,519.92	$ 3,678.83
Wages, Temporary Men	1,410.98	1,858.19	3,269.17
Equipment	33.25	48.26	81.51
Other Supplies	54.39	6.81	61.20
Transportation and Travel	2,743.52*	3,025.64**	5,769.16
Total Expenditures	6,401.05	6,458.82	12,859.87
Less 2/3 of Equipment and Trucks	707.54	689.72	1,397.26
Net Cost of Operations	$5,693.51	$5,769.10	$11,462.61

* Includes gross cost of trucks numbers 54 and 58 in amount of $1,023.08
** Includes gross cost of trucks numbers 55 and 56 in amount of $1,022.44

SUMMARY OF RESULTS

1. The forests of Wyoming and Colorado aggregate about thirty-one and one-half million acres or approximately one-fourth of the area of the two states.

2. Most of the forested area of these states lies within the boundaries of 24 National Forests, 3 National Parks and 1 Indian Reservation.

3. The 24 National Forests contain over 55 billion board feet of timber.

4. The important forest trees in the two states are lodgepole pine, Engelmann spruce, western yellow pine, alpine fir, Douglas fir, limber pine, bristlecone pine, white bark pine, juniper and pinyon pine.

5. The 5-needled or white pines of the two states are Pinus flexilis (limber pine) which occurs throughout the timbered areas of both states, P. albicaulis (white-bark pine) found in northwestern Wyoming and P. aristata (bristlecone pine) which occurs in all except the extreme northern and northwestern forests of Colorado.

6. The survey results, which are incomplete, show that over four and one-quarter million acres in the two states support various amounts of one or more species of white pine and over one-half million acres of this area have comparatively valuable stands. It is estimated that the completed survey will show that the two states contain approximately one million acres that support stands of white pine with relatively high use value.

7. The commercial timber value of the three species of white pine in Wyoming and Colorado is not great although they provide some railroad ties, mine props, lumber, fence posts and fuel wood. The chief value of these species, which grow

The following tabulation shows the cost of the work in Colorado and Wyoming for 1954.

TABLE No. 4

COLORADO AND WYOMING COSTS
1954

Item	Wyoming	Colorado	Total
Salaries, Permanent Men	$62,728.44	$1,816.28	$ 3,470.63
Salar. Temporary Men	1,410.00	3,440.14	5,850.17
Equipment	25.80	40.26	[illegible]
Other Supplies	81.36	6.81	51.81
Transportation and Travel	3,745.52*	3,020.44*	2,765.16
Light Expenditures	5,401.00	6,406.78	12,806.47
Lease S/S of Pasture and Tracts	707.54	805.73	1,507.35
Net Cost of Operations	80,699.81	13,766.11	94,465.91

* Includes gross cost of trucks numbers 84 and 85 in amount of $1,052.44
* Includes gross cost of trucks numbers 84 and 85 in amount of $1,052.44

SUMMARY OF ANALYSIS

1. The forests of Wyoming and Colorado supported about thirty-one million acres or approximately one-fourth of the area of the two states.

2. Most of the forested area of these states lies within the boundaries of the National Forests, 3 National Parks and 1 Indian Reservation.

3. The 24 National Forests contain over 80 billion board feet of timber.

4. The important forest trees in the two states are Douglas fir, Engelmann spruce, western yellow pine, alpine fir, Douglas fir, limber pine, ponderosa pine, white-bark pine, Juniper and pinyon pine.

5. The 6-needled or white pines of the two states are Pinus flexilis (limber pine) which occurs throughout the timbered areas of both states, P. albicaulis (white-bark pine) found in northwestern Wyoming and P. reflexa (bristlecone pine) which occurs in all except the extreme northern and northwestern forests of Colorado.

6. The survey results, which are incomplete, show that over four and one-quarter million acres in the two states support various associations of one or more species of white pine and over one-half million acres of this area have commercially valuable stands. It is estimated that the completed survey will show that the two states contain approximately one million acres that support stands of white pine with relatively high use value.

7. The commercial timber value of the three species of white pine in Wyoming and Colorado is not great although they provide some ponderosa pine, mixed spruce, Douglas fir, lodgepole pine and limber pine. The chief value of these species, which grow

mostly on rocky or thin soiled and exposed sites, lies in their protection of watersheds, prevention of soil erosion, sheltering of wild life and provision of recreational and scenic areas.

8. Within the stands of white pine in both states were found 11 species of Ribes of which not more than 8 species were found in any one stand.

9. In the uplands there are from 1 to 38 Ribes bushes per acre while the moist stream bottoms support from 18 to 279 bushes per acre. Compared with Inland Empire conditions the population of Ribes in the white pine stands of Wyoming and Colorado ranges from very low to medium.

10. Experiments to determine the cost of blister rust control in the Central and Southern Rocky Mountain Region have not been conducted. The cost of control work in the Inland Empire white pine involving approximately the same numbers of Ribes per acre that occur in Wyoming and Colorado ranges from $0.24 to $2.28 per acre in the uplands and from $1.32 to $4.74 per acre in the stream type. The average cost per acre for the upland work is $0.72 while for the stream type it is $2.67.

11. It is believed that costs in the Central and Southern Rocky Mountain Region will be only slightly higher than in the Inland Empire due chiefly to more difficult working conditions, the occurrence of the white pine in relatively small units and the remoteness of many of the areas.

mainly on rocky or thin soiled and exposed sites, like the presence of
watersheds, prevention of soil erosion, obstructing of wild life and protection of
recreational and scenic areas.

8. Within the stands of white pine in both states were found 11 species of
pine of which not more than 5 species were found in any one stand.

9. In the volumes there are from 1 to 32 White trunks per acre while the
total stems bottom support from 12 to 272 trunks per acre. Compared with
United States conditions the population of pines in the white pine stands of
Wyoming and Colorado ranges from very low to medium.

10. Numerous to determine the cost of timber west worked in the Central
and Southern Rocky Mountain Region have not been conducted. The cost of control
work in the Uinta and Teuton white pine involving approximately the same numbers of
trees per acre that occur in Wyoming and Colorado ranges from $0.04 to $0.25 per
acre in the volumes and from $1.25 to $4.75 per acre in the rating type. The
average cost per acre for the volumes work is $0.79 while for the stump type it is
$2.57.

11. It is believed that areas in the Central and Southern Rocky Mountain
region will be only slightly higher than in the Uinta Teuton due chiefly to more
difficult working conditions, the occurrence of the white pine in relatively small
units and the remoteness of many of the areas.

PROGRESS IN CHEMICAL INVESTIGATIONS

By
H. R. Offord, Agent; C. R. Van Atta, Agent; R. P. d'Urbal, Assistant Chemist; and C. R. Quick, Jr. Microanalyst

INTRODUCTION

The present summary covers the activities of the chemical investigative unit for the period September, 1933 to September, 1934 and describes briefly the following topics:

A. Results of the 1933 field work.
B. Laboratory and greenhouse work September, 1933 to June, 1934.
C. Field experiments of 1934.
D. Gross morphology of stem and root systems of California Ribes.
E. Recommendations for the use of chemicals in Ribes eradication.
F. Outline of laboratory work for the winter of 1934-1935.

A review of the activities of this project under the foregoing topics will show that the field work of 1934 is a logical "sequitur" to the results of the 1933 work, and plainly indicates the trend of future studies.

In 1933 the study of chemical methods for the eradication of upland Ribes was, for the first time, made a major feature of the experimental program. This marked a definite change from stream type work which had been the primary interest of this project since 1925. Experiments on the decapitation method for eradicating Ribes of the individual bush type were undertaken in California, in Oregon, and in Idaho. Idaho stream type work for 1934 comprised experiments on Ribes petiolare in which the toxicity of sodium chlorate was compared with the toxicity of a mixture of sodium chlorate and sodium bicarbonate.

A. RESULTS OF 1933 FIELD WORK

California

Spray and Soil Drench Treatments

Data were taken on the 1933 spray and soil drench plots at Fiddlers Green, Cow Creek, and Gooseberry Camp, June 6 to 15. All plots were marked off by string lines into milacre sub-plots to facilitate the recording and analysis of field data. Sketch maps were also made of the plots to permit subsequent analysis of data on the basis of soil type, soil moisture, windfall, character of duff, and surface litter. Summarized results of these experiments are given in Table No. 1; data for the thiocyanate and chlorate tests are further analyzed in Table No. 2.

When applied as a spray and soil drench to intact bushes, Diesel oil again proved to be more effective on R. roezli than any other substance. Furthermore, it is highly satisfactory to use because of low cost and safety in handling. Diesel oil applied to intact bushes, at the rate of 0.47 pints per bush spray plus 1.30 pints per bush soil drench, killed 100 per cent live stem and 90 per cent of the bushes. The plants treated varied from the largest R. roezli usually

California

encountered within sugar pine type, to very young plants. All bushes were vigorous and healthy. The soil was dry for the first six inches but became somewhat moist at greater depths. The results of these spray and soil drench treatments together with those from the decapitation work are in complete agreement with previous experiments, and attest the high effectiveness of Diesel oil on R. roezli in all sugar pine-yellow pine type, mature or cut over.

Applied at the rate of 2,467 pounds per acre ammonium thiocyanate killed 93 per cent of the bushes while 8,703 pounds of sodium chlorate accounted for only 67 per cent. These figures, however, should be considered in the light of soil conditions and vigor of Ribes on the respective plots in order to evaluate correctly the comparative toxicity of the two chemicals. On Plot 9 the bushes were smaller and less vigorous, and the soil was drier and somewhat lighter than on Plot 3b; and finally, there was considerably more ground litter and humus on Plot 3b than on Plot 9.

One especially interesting feature of these experiments was the apparent greater effectiveness of the sodium chlorate-sodium bicarbonate mixture over the straight chlorate. This mixture represents one of the few combinations of chlorate which has proved to be as toxic as the straight chemical. Furthermore, the mixture represents a comparatively safe combination from the standpoint of spontaneous combustion. While the experiments undertaken with this mixture have not been extensive enough to justify final conclusions in regard to this high toxicity, they agree substantially with the results of similar tests on R. reticulare in north Idaho.

Data for individual milacres showed that both chlorates and chlorate plus bicarbonate were slightly more effective on R. roezli of moist than of dry habitat. R. roezli did not occur to any great extent on wet and soggy ground immediately contiguous to stream flow, but for the occasional bush that did occur under such conditions it was noted that a high efficiency was invariably obtained. Most of the plants grew on moist well-drained soil. The presence of ground litter and thick duff appeared to be more effective in reducing the toxicity of the applied chemical than variation of soil character and soil moisture.

RESULTS OF 1933 SPRAY AND

Location and Plot No.	Number Bushes Treated	Chemical Used	Gallons Solution Per	5	5	8	8	5	8	5	2	5	Aver	Aver
Area I* Plot 1	105	Sodium chlorate Sodium bicarbonate												
2	187	Sodium chlorate Sodium bicarbonate												
3a	330	Sodium chlorate Sodium bicarbonate												
3b	219	Sodium chlorate												
4a	348	Zinc ammonium chloride												
4b	354	Zinc ammonium chloride												
5	624	Zinc ammonium chloride												
6	273	Sodium chlorate Sodium bicarbonate												
7	290	Ammonium thiocyanate												
8	639	Ammonium thiocyanate												
9	585	Ammonium thiocyanate												
Area II** Plot 2	365	Diesel oil												
2	365	Diesel oil												

* Area I -- Fiddlers Green (Sec. 11, T5N, R5E, M.D.M.)
** Area II -- [illegible] (Sec. 24, T5N, R[illegible])

in all auger pine-yellow pine type, mature or cut over.

Applied at the rate of 8,407 pounds per acre ammonium thiocyanate killed 98 per cent of the brakes while 8,705 pounds of sodium chlorate accounted for only 87 per cent. These figures, however, should be considered in the light of soil conditions and vigor of kinds on the respective plots in order to evaluate correctly the comparative toxicity of the two chemicals. On plot 3 brakes were smaller and less vigorous, even the soil was lighter and somewhat slightly on plot 3b; and finally, there was considerably more grass and annuals on plot 3b than on plot 3.

One especially interesting feature of these experiments was the apparent greater effectiveness of the sodium chlorate-sodium bicarbonate mixture over the straight chlorate. This mixture proved to be as toxic as the straight chemical. Furthermore, the mixture represents a comparatively safe combination from the standpoint of spontaneous combustion. While the experiments undertaken with this mixture have not been extensive enough to justify final conclusions in regard to this high toxicity, they serve considerably more than previous tests to emphasize its potentialities.

conditions to stream flow, but for the occasional small that did occur under such conditions it was noted that a high efficiency was invariably obtained. Most of the plants grew on moist well-drained soil. The presence of ground litter and thick duff appeared to be more effective in reducing the toxicity of the applied chemical than variation of soil character and soil moisture.

moist at greater depths. The results of these spray and soil drench treatments together with those from the defoliation work are in complete agreement with previous experiments. [illegible]

TABLE NO. 1

RESULTS OF 1933 SPRAY AND SOIL DRENCH TREATMENTS OF R. ROEZLI, STANISLAUS NATIONAL FOREST, CALIFORNIA

Location and Plot No.	Number Bushes Treated	Chemical Used	Gallons Solution Per Acre	Pounds Chemical Per Acre	Percent Dead Stem	Percent Dead Bushes	Physical Character of Plot
Area I * Plot 1	103	Sodium chlorate Sodium bicarbonate	5,058	2,428 3,642	89	39	Free from duff. Lower part of plot moist at 4". Upper part of plot moist at 12". Loose textured sandy loam. Root depth 6" to 24".
2	187	Sodium chlorate Sodium bicarbonate	5,566	5,287 2,644	95	74	Lower end of plot moist at 3" and wet at 6". Upper part of plot moist at 6" and wet at 12". Top 6" soil rich black loam with silt underlying. Root depth 3" to 10".
3a	380	Sodium chlorate Sodium bicarbonate	8,990	8,540 4,271	99	85	Lower part of plot moist at 10" and wet at 30". Upper part of plot moist or wet at surface. Surface soil black loam with sandy stratum below. Root depth 10" to 18".
3b	216	Sodium chlorate	9,065	8,703	94	67	Lower part of plot moist at 6" and upper part of plot wet or moist at surface. Soil similar to Plot 3a. Root depth 6" to 9".
4a	238	Zinc ammonium chloride	3,011	5,289	65	5	Duff layer 1" to 2" over most of plot. Soil moist at 6" to 14". Loose textured sandy loam. Root depth 6" to 14". Considerable windfall, especially in southeast corner.
4b	253	Zinc ammonium chloride	5,072	8,926	82	24	Duff layer 1" to 2" over most of plot. Soil moist at 6" to 14". Loose textured sandy loam. Root depth 6" to 14". Considerable windfall, especially in southeast corner.
5	624	Zinc ammonium chloride	8,920	15,697	83	31	Northeast corner moist at surface. Duff layer 1" to 2" over drier part of plot. Optimum moisture on most of plot at 12" to 18". Soil fine sandy loam. Root depth 12" to 18".
6	273	Sodium chlorate Sodium bicarbonate	9,360	4,493 6,734	89	50	This plot wettest of series, soil being moist or wet over entire plot. Upper part of plot covered with considerable bark and rotten wood. Soil black loam and silt. Root depth 4" to 10".
7	290	Ammonium thiocyanate	2,047	3,388	94	52	Duff layer 1" to 2". Surface soil dry to depth of 3" to 4". Soil moist at 18" to 24". Soil loose textured sandy loam. Root depth 7" to 15". Ribes located near 7 or 8 windfall.
8	639	Ammonium thiocyanate	2,987	4,948	97	62	Duff 1" thick or less. Soil moist at 15" to 30". Soil fine textured and sandy. Root depth 8" to 18". Scattered debris and windfall on northeast corner of plot.
9	555	Ammonium thiocyanate	5,101	8,467	100	93	Soil exposed, little or no duff or grass. Soil moist at 9" to 15". Soil sandy loose textured and well drained. Root depth 8" to 13". No windfall or stumps.
Area II** Plot 2	325	Diesel oil	Average 1.73 pts. per bush.		100	98	Plot open, shaded only in early morning. Soil dry to depth of 4" to 8" and moist at 24". Soil loose textured sandy loam. Root depth 8" to 18".
3	365	Diesel oil	Average 0.53 pts. per bush.		85	70	Plot shaded until 9:30 a.m. Upper edge bordered by timber. Soil moisture below optimum at 24". Soil loose textured and light. Root depth 12" to 20".

* Area I -- Fiddlers Green (Sec. 11, T5W, R18E).
** Area II -- Cow Creek (Sec. 34, T5N, R18E).

Annual Report 1934
H. R. Offord

TABLE NO. 2

EFFECTIVENESS* OF CHLORATE AND THIOCYANATE ON R. ROSELLI OF DIFFERENT SIZE CLASSES

Plot Number	0-10 Feet Live Stem		10-25 Feet Live Stem		25-10 Feet Live Stem		Over 100 Feet Live Stem	
	Number Bushes on Plot	Percent Dead Bushes	Number Bushes on Plot	Percent Dead Bushes	Number Bushes on Plot	Percent Dead Bushes	Number Bushes on Plot	Percent Dead Bushes
1	30	20	15	73	50	35	18	44
2	109	75	36	80	34	71	8	25
3a	124	93	126	92	112	72	18	56
3b	80	63	72	76	57	66	7	43
6	105	61	68	54	88	70	12	25
7	122	68	104	50	56	29	8	0
8	195	81	182	69	283	51	29	17
9	281	92	168	98	99	94	7	86

* See Table No. 1 for data on dosage. Plots 1 to 6 chlorate and 7 to 9 thiocyanate.

The effectiveness of sodium chlorate and of ammonium thiocyanate on bushes of various size classes is shown in Table No. 2. The facts brought out in this table are in agreement with those previously recorded for R. inerme in north Idaho, namely, that large bushes are harder to kill than small ones. With three exceptions, per cent kill for the two largest size classes of bushes was consistently lower for both chlorate and thiocyanate than the corresponding figures for the smaller bushes. With one exception per cent kill was lowest for bushes having 100 or more feet of live stem.

Decapitation Work

Results of the decapitation experiments were uniformly good, as is shown in Table No. 3. Diesel oil and ammonium thiocyanate should be fully effective when applied to the mutilated crown of topped bushes in quantities of around two and three ounces per bush. Diesel oil should probably be used in all dry sites for work on R. roezli and R. cereum while ammonium thiocyanate either in saturated aqueous solution or in dry form may be more effective on wet sites. The Pulaski has proven to be a satisfactory tool for the decapitation of R. roezli and R. cereum and is recommended for regular crew work.

Table No. 2

EFFECTIVENESS OF CHLORATE AND THIOCYANATE ON R. TYPHA IN [illegible]

Plot Number	0-10 Feet live stem: Number Brushes on Plot	0-10 Feet live stem: Percent Dead Brushes	10-20 Feet live stem: Number Brushes on Plot	10-20 Feet live stem: Percent Dead Brushes	20-100 Feet live stem: Number Brushes on Plot	20-100 Feet live stem: Percent Dead Brushes	Over 100 Feet live stem: Number Brushes on Plot	Over 100 Feet live stem: Percent Dead Brushes
1	[illegible]	[illegible]	15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	109	76	25	80	24	72	5	80
3	124	92	128	92	114	70	16	62
4	63	52	[illegible]	76	[illegible]	[illegible]	[illegible]	[illegible]
5	105	81	56	64	68	[illegible]	[illegible]	[illegible]
7	122	84	104	80	56	39	8	0
8	[illegible]	[illegible]	[illegible]	[illegible]	288	61	29	17
9	261	52	166	28	96	54	7	86

* See Table No. 1 for data on dosage. Plots 1 to 6 chlorate and 7 to 9 thiocyanate.

The effectiveness of sodium chlorate and of ammonium thiocyanate on bushes of various size classes is shown in Table No. 2. The facts brought out in this table are in agreement with those previously recorded for R. inermis in north Idaho, namely, that large bushes are harder to kill than small ones. With [illegible] consistently lower for both chlorate and thiocyanate than the corresponding figures for the smaller bushes. With one exception per cent kill was lowest for bushes having 100 or more feet of live stem.

Deexpitation Work

Results of the deexpitation experiments were uniformly good, as is shown in Table No. 3. [illegible] and R. cerewm and is recommended for regular crew work.

TABLE NO. 3

RESULTS OF 1933 DECAPITATION EXPERIMENTS IN CALIFORNIA, IDAHO, AND WASHINGTON

Plot Number and Location	Number Ribes Treated	Species	Date of Treatment	Chemical Used	Ounces Chemical Per Crown	Ounces Water Per Crown	Number Live Bushes	Number Dead Bushes	Percent Dead Bushes
California									
Area I (a) Edge Plot 1	7	R. roezli	7/12	Sodium fluoride	1.0	1.0	2	5	71
Edge Plots 1, 2	27	R. roezli	8/16	Sodium fluoride	0.5	0.5	4	23	85
Plot 6	21	R. roezli	8/16	Sodium fluoride	2.0	2.0	0	21	100
Plot 10	72	R. roezli	7/24, 7/31	Sodium fluoride	1.0	1.0	2	70	97
Plot 5	35	R. roezli	8/15, 8/16	Ammonium thiocyanate	0.9	0.7	0	35	100
Area I Controls	35	R. roezli	7/12 to 8/16	(Controls)	-	-	26	9	26
Area II (b) Plot 1	42	R. roezli	8/18	Diesel oil	1 fluid ounce	-	2	40	95
Plot 2	80	R. roezli	8/18, 8/21	Diesel oil	8 fluid ounces	-	0	80	100
Area II Controls	36	R. roezli	8/18, 8/21	(Controls)	-	-	30	6	17
Area III (c) Plot 1	40	R. cereum	7/25, 7/29	Sodium fluoride	2	2	28	12	30
Area III Controls	9	R. cereum	7/25, 7/29	(Controls)	-	-	9	0	0
Idaho									
Plot 1 (d)	92	R. viscosissimum	8/1	Copper sulphate	3-4	3-4	6	86	93
Plot 2 (d)	113	R. viscosissimum	8/2	Sodium fluoride	3-4	3-4	9	104	92
Plot 3 (e)	150	R. viscosissimum	8/17	Ammonium thiocyanate (g)	3-4	3-4	0	150	100
Washington									
Plot 1 (f)	6	R. cereum	9/21	Ammonium thiocyanate (g)	5-6	5-6	0	6	100

(a) Fiddlers Green, Stanislaus National Forest.
(b) Cow Creek, Stanislaus National Forest.
(c) Gooseberry Camp, Stanislaus National Forest.
(d) Johnson Creek, St. Joe National Forest.
(e) Bobs Creek, near Emida.
(f) Garden Springs, vicinity of Spokane, Washington.
(g) Applied as aqueous solution 2.5 lbs. per gallon water.

Annual Report 1934
H. R. Offord

Weather Conditions During Experimental Work

No rain fell during the period of experimentation, July 25 to August 15, and records do not show appreciable precipitation for six weeks after the conclusion of experimental work. During the work period the sky was usually clear with air temperatures ranging from 68° F. to 91° F. and relative humidity from 17 to 58 per cent. The former averaged around 75° F. and the latter [illegible] per cent. In evaluating the comparative results summarized in Table No. 1, no account need be taken of climatic factors. During and after application of the chemicals the water table was dropping slightly, a condition which is believed to be most favorable for optimum killing action.

Idaho

Ammonium Thiocyanate Plot Experiments at Clarkia

These 1933 experiments were designed to show whether or not the results of the R. inerme plot studies performed in the Wenatchee National Forest during 1931 and 1932 are directly applicable to Idaho stream type conditions. This unit had not previously tested ammonium thiocyanate as an herbicide upon R. petiolare, and the 1933 experiments at Clarkia were also intended to furnish information concerning its effectiveness upon this species.

The plots were checked by milacre sections during the last week of May 1934. Almost unprecedented floods which occurred in the St. Maries Valley during the preceding winter greatly impaired the accuracy of the dead Ribes stem measurement. The stem data will, therefore, not be given in this report. Omission of the figures is, however, of little consequence for, as shown on pages 225 and 230 of the 1933 annual report by this office, stem kill does not afford a basis for evaluating an herbicide in this type of study. Plant kill is, however, a very satisfactory criterion of effectiveness. Fortunately a dense brush cover on the plots and thickets upstream protected the Ribes roots and crowns from the action of the flood water so that it was possible to count the live and dead Ribes plants with considerable accuracy. These checking data are given in Table No. 4.

Figure 1 presents an analysis of the data for R. inerme and compares them with the corresponding information gathered from the tests of the previous two years. The principle underlying this type of analysis was set forth in the text on pages 241 and 245 of the 1932 annual report. It will only be necessary at this time to repeat that the chemical dosage representing maximum economy is determined by the position of the point at which the slope of the curve is one.

Improvements in field technique practiced during 1931-32 and 33 were largely responsible for the close agreement between the results as disclosed in Figure 1. The two curves may be fairly regarded as representing the range through which stream type R. inerme varies in susceptibility to ammonium thiocyanate, while the mean represents "average" susceptibility.

Idaho

Ammonium Thiocyanate Plot Experiments at Clarkia

These 1938 experiments were designed to show whether or not the results of the U. Inerme plot studies performed in the Pocatello District during 1937 and 1937 are directly applicable to Idaho climate conditions. This was due partly to the heavy rainfall encountered in the Pocatello area and the 1938 experiments at Clarkia were conducted on an isolated [illegible] concerning its effectiveness upon this species.

The plots were checked by milacre sections during the last week of May [illegible]. Under favorable field conditions it is [illegible]. During the growing season. The plots were [illegible] of the two [illegible] figures, however, it little [illegible] of the first annual [illegible] this article, that will [illegible] resulting in [illegible] additional [illegible] of eliminations. [illegible] plots and subject [illegible] the first [illegible] of the final [illegible] correlation [illegible].

Figure 1 presents an analysis of the data for U. inerme and compares them [illegible] the corresponding information [illegible] on pages 241 and 245 of the 1938 annual report. It will only be necessary at this [illegible] by the position of the point at which the slope of the curve is one.

Improvements in field technique practiced during 1937-38 and 38 were [illegible] the mean represents "average" susceptibility.

TABLE NO. 4

GROSS RESULTS OF AMMONIUM THIOCYANATE PLOT EXPERIMENTS PERFORMED AT CLARKIA, IDAHO DURING 1933 (1)

Plot No.	Lbs. 80 Percent Chemical Per Acre (2)	A. inerme			R. petiolare			R. lacustre		
		Plants Treated	Plants Dead	Percent Plants Dead	Plants Treated	Plants Dead	Percent Plants Dead	Plants Treated	Plants Dead	Percent Plants Dead
1	500	214	1	0.5	15	10	67			
2	750	120	1	1	42	24	57			
3	1,000	237	5	2	8	7	87			
4	2,000	41	29	71	134	128	96	17	9	53
5	3,500	12	10	83	180	171	95			
6	5,000	109	107	98	82	75	91			
7	2,000	88	58	66	394	271	69	39	19	49

(1) Complete coverage spray applied to all plots except No. 7. Selective spray treatment applied to Ribes only on Plot No. 7.

(2) To convert to 95 per cent pure basis multiply figures given by 0.84.

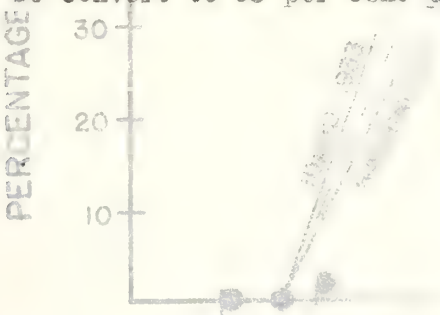
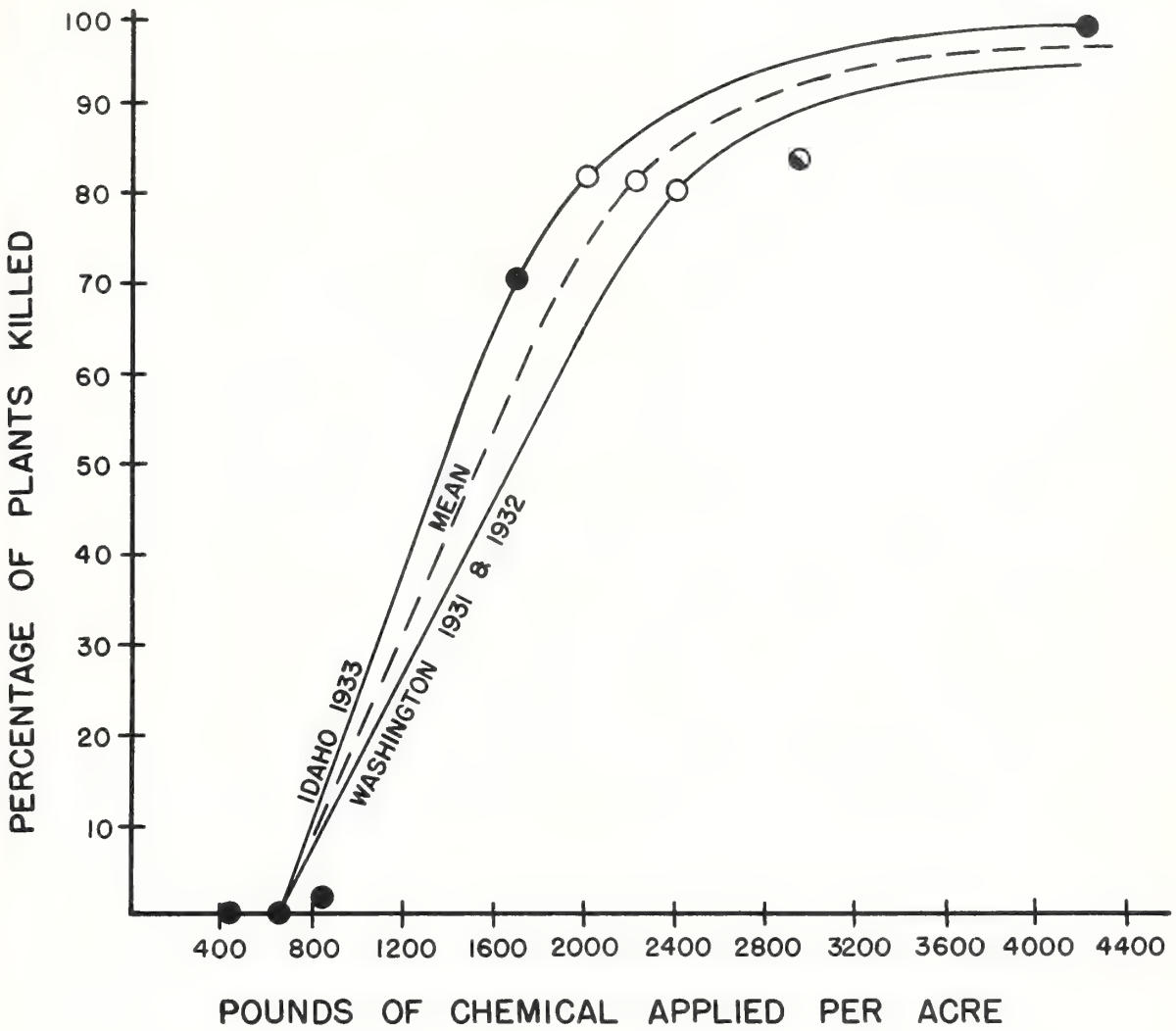


FIGURE NO. 1

RELATION OF R. INERME PLANT KILL TO DOSAGE OF 95 % PURE AMMONIUM THIOCYANATE APPLIED AS A SPRAY.



LEGEND

● CHECKING DATA 1933 TESTS. CLARKIA, IDAHO.

◔ " " " " " " LOCATION OF THIS POINT SHOULD BE DISREGARDED SINCE IT REPRESENTS A TOTAL OF ONLY 12 PLANTS

○ SLOPE EQUALS UNITY. POINTS REPRESENTING MAXIMUM ECONOMY.

Annual Report 1934
H. R. Offord

Proper dosages of ammonium thiocyanate to be applied as a spray to R. inerme as given by the curves in Figure 1 are:

Season	Pounds Chemical Per Acre Actually Treated	Percent Plant Kill
1931-1932	2,400	80
1933	2,080	81.7
Mean 1931-32 and 33.	2,240	81.2

From the data in Table No. 4 it will be seen that the selective treatment applied on Plot No. 7 was 97 per cent as effective upon R. inerme as the complete coverage spray of the same basic dosage applied to Plot No. 4. This factor has been applied to a further study of the curves in Figure 1, and it can be shown that if ammonium thiocyanate is applied as a selective spray at the basic rate of 2,200 pounds per acre actually treated the R. inerme plant kill should be expected to vary between 69 and 80 per cent for each application. This represents the maximum economy that can be attained with ammonium thiocyanate by existing eradication methods.

The results of the tests indicate that ammonium thiocyanate is inferior to sodium chlorate as an herbicide upon R. petiolare. High soil moisture appears to be associated with low effectiveness of ammonium thiocyanate upon R. petiolare, although this point is not fully proven. Analysis of the data for R. petiolare indicates that maximum efficiency is reached with a dosage of 1,[illegible] pounds of ammonium thiocyanate per acre actually treated. The plant kill to be expected from such a treatment would vary from 53 to 66 per cent. Sodium chlorate is capable of considerably better efficiency under widely varying conditions. Thus, while ammonium thiocyanate could be used satisfactorily upon R. inerme, its use upon R. petiolare cannot be recommended upon the basis of efficiency.

It is interesting to note the gross effects produced upon Ribes and stream type brush by complete coverage ammonium thiocyanate spray. When complete coverage spray is applied practically all the stems are killed even though the dosage may be considerably less than that required to produce one hundred per cent plant kill. Brush so treated is in excellent condition for destruction by burning the season after the chemical is applied. This fact suggests that chemical spraying might be substituted for slashing on certain areas where the ultimate aim is to destroy the brush by burning. Acting upon a proposal to this effect trial of the method was begun in August of 1934 at Elk Creek, Idaho by V. Moss. Ammonium thiocyanate was sprayed on the brush at the rate of 2,300 pounds per acre upon a two-acre test plot. An attempt will be made to burn the brush in 1935.

Photographs Nos. W1199, W1199-1, W1200, W1200-1, W1195, W1195-1, W1197, and W1197-1 show the conditions on the experimental area at Clarkia in 1933 and 1934 and illustrate the difference between the effect of complete coverage and selective spraying.

Proper dosages of ammonium thiocyanate to be applied as a spray to *P. Ineme* as given by the curves in Figure I are:

Season	Pounds Chemical Per Acre Required Dosage	
1931-1932	2,400	80
1932	[illegible]	[illegible]
Mean 1931-32 and 33.	2,340	81.

From the data in Table No. 4 it will be seen that the selective treatment applied on Plot No. 7 was 33 per cent as effective upon *P. Ineme* as the complete coverage spray of the same basic dosage applied to Plot No. 4. This factor has been applied to a further study of the curves in Figure I, and it can be shown that if ammonium thiocyanate is [illegible] as the basic rate of 2,340 pounds per acre [illegible] *P. Ineme* [illegible] should be expected to very nearly [illegible] represents the maximum economic [illegible] existing eradication methods.

The results of the tests indicate that ammonium thiocyanate is inferior [illegible] *P. pallidus*. [illegible] indicates that maximum efficiency is reached with a dosage of 1,20[illegible] pounds of ammonium thiocyanate per acre actually treated. The plant kill to be expected from such a treatment would vary from 58 to 68 per cent. Sodium chlorate is capable of considerably [illegible] upon *P. pallidus*. [illegible] upon *P. petiolare* cannot be recommended upon the basis of efficiency.

It is interesting to note the gross effects produced upon Ribes and stream type brush by complete coverage spraying. [illegible] coverage only is applied practically all the plant kill. Brush, to [illegible] change may be considerably less than half required to produce the same plant kill. Brush, to [illegible] is in [illegible] the [illegible] the spraying might be substituted for clearing on certain areas where the ultimate aim is to destroy the brush by clearing. Letter 9000 I [illegible] trial of the method was begun in August of 1932 at the [illegible], Idaho, spraying thiocyanate was started on the basis of [illegible] pounds per acre upon a two-acre test plot. An attempt will be made to burn the brush in 1933.

Paragraphs [illegible] and 31327-I show the conditions [illegible] and illustrate the [illegible] selective spraying.



W1199-Stream type brush on St. Maries River, Clarkia, Idaho. Photograph taken before treatment in 1933.



W1200-Stream type brush adjacent to that shown in W1199. Photograph taken prior to treatment in 1933



W1199-1. Same as W1199. Photograph taken in spring following selective application of ammonium thiocyanate spray



W1200-1, Same as W1200. Photograph taken in spring following application of ammonium thiocyanate spray. Foreground and right middle distance treated with complete coverage; remainder of area received selective spray.



W1195-Stream type brush on chemical investigations plots. Clarkia, Idaho 1933



W1197-Another view similar to W1195, same locality.



W1195-1 Same as W1195. Spring following ammonium thiocyanate application. Foreground complete coverage, middle distance selective spray.



W1197-1, Same as W1197. Spring following application of complete coverage ammonium thiocyanate spray. Note almost complete absence of live stem and compare with photographs of selective spray results.

Chlorate-Bicarbonate Spray Tests on R. petiolare

Plots Nos. 8, 9, and 10, located on the St. Maries River about one-half mile downstream from the Clarkia station, were carefully checked during the latter part of May and again in July. As shown in Table No. 5 the chlorate-bicarbonate spray and soil drench treatments were 100 per cent effective. Two facts are clearly established by these experiments: (1) That 800 pounds of sodium chlorate and 1,600 pounds of sodium bicarbonate per acre as applied to Plot No. 8, represent a treatment that is fully effective on R. petiolare; (2) that the addition of bicarbonate does not destroy the usual high efficiency of chlorate. Because of the fact that the lightest treatment was 100 per cent effective, nothing can be learned from these experiments regarding minimum lethal dosage of chlorate and bicarbonate. This topic has been further studied in 1934 (see Table No. 9).

TABLE NO. 5

RESULTS OF CHLORATE-BICARBONATE SPRAY AND SOIL DRENCH TESTS ON R. PETIOLARE, CLARKIA, IDAHO, 1933

Plot* Number	Chemical Used	Concentration in Pounds Per Gallon Solution	Gallons Solution Per Acre	Pounds Chemical Per Acre**	Percent Dead Bushes
8	Sodium chlorate	0.55	1,440	800	100
	Sodium bicarbonate	1.11		1,600	100
9	Sodium chlorate	0.94	1,680	1,600	100
	Sodium bicarbonate	0.48		800	
10	Sodium chlorate	0.49	3,280	1,600	100
	Sodium bicarbonate	0.49		1,600	

* Each plot measured 66 by 33 feet.

**Dosage given in this column is that of the theoretical set up. Actual dosage applied was slightly less, e.g. 792 pounds per acre instead of 800 for Plot No. 8.

Decapitation Tests

The results of all 1933 decapitation tests in the far West are presented in Table No. 3. The Idaho work was undertaken near Johnson Creek, St. Joe National Forest in August, 1933 and was checked in May, 1934. Copper sulphate and sodium fluoride killed 93 per cent and 92 per cent of the bushes respectively. However, it is most probable that decapitation and crown scarification in themselves caused considerable damage. Consequently, survival of bushes could be accounted for on the basis of either insufficient chemical or improper cutting. Crown sprouts of the fifteen surviving bushes appeared to be sufficiently vigorous to ensure reestablishment of the plants.

Washington

Ammonium Thiocyanate Soil Drench Tests on R. cereum.

The R. cereum bushes located near the Sunset Highway two miles south of Spokane were examined on June 14, 1934. These bushes had been treated September

Plots Nos. 8, 9, and 10, located on the St. Maries River about one-half mile downstream from the Shafia section, were carefully checked during the latter part of May and again in July. As shown in Table V, the chlorate-bicarbonate spray and soil drench treatments were 100 per cent effective. Two years are already established by these comparisons: (1) Both 50-pound and 1,000-pounds of sodium bicarbonate per acre are effective in killing Scotch broom and a treatment that is fully effective on St. Maries soil (2) Scotch broom does not destroy the roots of plants. (3) Sodium chlorate, the last cost the lighter treatment, was 100 per cent effective from three years' observation (4) Possible stimulation of plant growth. This study has been carried on in cooperation with

Table No. 5

RESULTS OF CHLORATE-BICARBONATE SPRAY AND SOIL DRENCH TESTS ON [illegible], Coeur d'Alene, Idaho

Plot* Number	Chemical Used	Concentration in Pounds per Gallon Solution	Gallons Solution Per Acre	Pounds Chemical Per Acre**	Percent Seed Trees
8	Sodium chlorate	0.68		800	100
	Sodium bicarbonate	1.11	1,440	1,600	100
9	Sodium chlorate	0.34		1,600	
	Sodium bicarbonate	0.46	1,860	800	100
10	Sodium chlorate	0.49		1,800	
	Sodium bicarbonate	0.49	3,280	1,600	100

* Each plot measured 66 by 33 feet.

**Dosage given in this column is that of the theoretical set up. Actual dosage applied was slightly less, e.g. 792 pounds per acre instead of 800 for Plot No. 8.

Decapitation Tests

The results of all 1935 decapitation tests in the Far West are presented in Table No. 2. The table read was published [illegible] Forest in August, 1936 and was checked in Sept. 1936. Cherry [illegible] Cascara killed 75 per cent and 50 per cent of the bushes respectively. Hazel is the most tenacious and green fruiting in [illegible] annual[illegible]. Consequently, several [illegible] the basis of other beneficial objects [illegible]. Cutting [illegible] the fifteen surviving leaves compared to [illegible] treatment. [illegible] reestablishment of the plants.

Ammonium Thiocyanate Soil Drench Tests on R. cereum.

The R. cereum bushes located near the Summit Highway two miles south of Spokane were [illegible]

21, 1933 with ammonium thiocyanate (3.5 pounds of commercial thiocyanate per gallon of water) applied at the uniform rate of one gallon of solution per square yard of soil surface. Thus each square yard of soil surface was treated with 1.76 pounds of 95 percent ammonium thiocyanate. Results of the check are summarized in Table No. 6.

TABLE NO. 6

RESULTS OF AMMONIUM THIOCYANATE SOIL DRENCH TESTS ON R. CEREUM

Method of Treatment	Gallons Solution Per Acre	Pounds Chemical Per Acre	Number Live Bushes	Number Dead Bushes	Percent Dead Bushes
Soil drench to intact bush.	4,840	8,518	12	34	74
Crown drench to decapitated bush.	4,840	8,518*	6	6	100

* On the decapitated bushes this dosage represents 0.44 pounds per composite crown.

Crown treatments of decapitated bushes resulted in 100 percent kill; thus, 0.44 pounds ammonium thiocyanate appears to be adequate for eradication of a clump of R. cereum having a crown spread not exceeding one-fourth of a square yard. Application of thiocyanate solution about the base of the intact clump or bush resulted in a 74 percent mortality. In most of the survivors there was a large reduction of live stem and the foliage was suppressed and marginally injured. None of the surviving bushes bore any fruit, in marked contrast to the heavy crop of fruit on the adjacent untreated bushes. The treated ground was entirely free of wild oats which grew luxuriantly on the surrounding soil.

B. LABORATORY AND GREENHOUSE WORK SEPTEMBER, 1933 TO JUNE, 1934

Laboratory and greenhouse investigations were undertaken during the period, September, 1933 to June, 1934 at Berkeley, California and Moscow, Idaho, and in general followed the outline plan given in the 1933 annual report.

The composition of the technical grade of thiocyanate furnished by the Koppers Company was studied, and a grade suitable for field use was specified. The corrosive action of thiocyanate on various metals was also investigated and the use of Delta metal was advised for the construction of castings and pump parts, with bronze as an alternative choice. Carpenter-type drums heavily coated inside with a waterproofing substance, or metal drums thickly coated with asphaltum paint, were recommended as containers. For details on these topics reference should be made to Research Reports Serial Nos. 51 and 53.

At Moscow, Idaho the translocation of ammonium thiocyanate in R. inerme was studied in a series of preliminary tests. Results of this work were stated to be as follows: (1) It is possible to secure limited downward movement of thiocyanate in R. inerme plants; also, the amount of chemical thus translocated is entirely inadequate to cause death or serious injury. (2) Sub-lethal doses of

Method of Treatment	Quantity Chemical Per Acre	Number Sprays	Interval Between Sprays
Crown drench to induce bud.	0.5%	1	None
Crown drench to decapitated bud.	0.5%	1	None

* On the decapitated buds this dosage represents 0.44 pounds per composite crown.

Crown treatments of decapitated buds resulted in 100 percent kill; a clump of R. cereum having a crown spread not exceeding one-fourth of a square yard of soil surface. Thus each square yard of soil surface was treated with 1.76 pounds of 98 percent ammonium thiocyanate. Results of this crown drench are given in Table No. 6.

Method of Treatment	Quantity Chemical Per Acre	Number Sprays	Interval Between Sprays
Bud drench to induce bud.	0.5%	1	None
Crown drench to decapitated bud.	0.5%	1	None

* On the decapitated buds this dosage represents 0.44 pounds per composite crown.

Crown treatments of decapitated buds resulted in 100 percent kill; a clump of R. cereum having a crown spread not exceeding one-fourth of a square yard of soil surface. Thus each square yard of soil surface was treated with 1.76 pounds of 98 percent ammonium thiocyanate. Results of this crown drench are given in Table No. 6.

Labor requirements were quantitatively studied during the period, September, 1932 to June, 1934 at Berkeley, California and Moscow, Idaho, and in general followed the outline given in the 1932 annual report.

The composition of the technical grade of thiocyanate furnished by the Koppers Company was studied, and a grade suitable for field use was specified. The corrosive action of thiocyanate on various metals was also investigated, the use of Delta metal was advised for the construction of castings and pump parts, with bronze as an alternative choice. Certain rubber-type [illegible] were recommended as containers. [illegible]

At Moscow, Idaho the translocation of ammonium thiocyanate in R. inops was studied in a series of preliminary tests. Results of this work were started to be as follows: (1) It is possible to secure limited downward movement of thiocyanate ion in R. inops plants; also, the amount of chemical that translocates is entirely inadequate [illegible]

thiocyanate may be altered within the plant and become harmless. (3) When thiocyanate is absorbed from solution it is concentrated in the ends of the stems. This phenomenon takes place more extensively in R. inerme than in R. petiolare. (4) Movement of thiocyanate and chlorate take place to a slight extent across the cortex of R. inerme and R. petiolare and was more rapid for thiocyanate than for chlorate. (5) The minimum lethal dose of thiocyanate for small greenhouse grown R. petiolare plants was found to be 750 to 1,000 pounds per acre. Details of this work are reported in Serial No. 64.

A qualitative and approximately quantitative method was worked out for the detection of small amounts of chlorate in plant extracts. This method depends upon the oxidation of thiocyanate by chlorate. It is fully described in Serial No. 65.

An apparatus was designed for measuring by means of a photoelectric cell the area of irregular bodies such as leaves. With the aid of suitable light filters the leaves themselves may be measured directly. This procedure is modified and improved over the chemical process suggested in the outline of last year's research work. Considerable time was devoted to the development of a chemical method, before this was discarded in favor of the direct photoelectric technique. A detailed account of this apparatus and procedure has not yet been prepared.

Nitella was used in a series of experiments on the toxic action of ammonium thiocyanate and chlorate. Results showed that aqueous ammonium thiocyanate stronger than 0.05 N was more actively plasmolytic than equivalent solutions of sodium chlorate. The two chemicals differed markedly, however, in the effectiveness of 0.01 N solutions. In this concentration ammonium thiocyanate was only slightly toxic to Nitella while sodium chlorate was definitely injurious. Apparently small quantities of the thiocyanate ion can be fixed or altered by the cell contents before serious injury takes place. Little or no accumulation of the thiocyanate ion was noted when cell sap was analyzed. This experiment has been reported in full in Serial No. 67.

Greenhouse experiments have been continued on the propagation of Ribes, Nitella, and Elodea; Ribes have been grown on soil and in culture solution, and Nitella and Elodea in culture medium. Further studies have been made in the germination of Ribes seed (Serial No. 61) and in the chemical control of harmful fungi during stratification of the Ribes seeds (Serial No. 62).

About 200 plants have been added to the Ribes garden located in Strawberry Canyon, Berkeley, California.

C. FIELD EXPERIMENTS OF 1934

California

Decapitation Tests

Decapitation experiments were undertaken in California on R. roezli and R. cereum. Data are given in Table No. 7.

Four R. roezli plots were located on Green's Flat, near Spanish Ranch, Plumas National Forest. Powdered borax was used as the killing agent on three of

these plots. In a fourth plot the bushes were cut off in the same manner as the chemically treated bushes, but were left as untreated controls. A Pulaski and H. K. Porter Forester No. 2 were used as cutting tools, the former proving to be by far the more satisfactory for general use.

The toxicity of chlorpicrin to R. cereum bushes, both intact and decapitated, was tested on a plot within the fenced off area used for the 1935 tests at Gooseberry Camp, Stanislaus National Forest. A mixture of chlorpicrin and kerosene was also used in this same series of experiments.

Some additional work was performed on surviving and untreated bushes within the 1933 experimental areas at Fiddlers Green and Cow Creek. In both locations a number of bushes were decapitated and treated with powdered borax. In effect, this was clean-up work because aside from making a bush count by species, no data were recorded and no attempt was made to mark the crowns. These plants, however, will serve as an additional check on efficiency of the borax treatment.

TABLE NO. 7

DECAPITATION AND CHEMICAL TREATMENT OF RIBES IN CALIFORNIA, 1934

Location and Plot Number	Date of Treatment	Number Bushes Treated	Species	Chemical Used	Ounces Chemical Per Crown	Remarks
Cow Creek (a)						About 30 bushes cut off with
Plot 1	6/27	80	R. roezli	Borax - Powdered	2	Pulaski, the balance with
1	6/27	10	R. cereum	Borax - Powdered	2	H. K. Porter No. 2.
Fiddlers Green (a)						Reworking of 1933 zinc ammonium
Plot 4	6/27	116	R. roezli	Borax - Powdered	2	chloride. Pulaski and H. K.
4	6/27	50	R. roezli	Controls	-	Porter used for decapitation.
Gooseberry Camp (a)						Reworking of 1933 sodium fluo-
Plot 1	6/26	11	R. cereum	Chlorpicrin	2-6	ride area. All Ribes treated
1	6/26	12	R. cereum	Chlorpicrin 1 volume		were in vigorous condition.
				+ Kerosene 1 volume	5-17	Special type of pal-injector
1	6/26	7	R. cereum	Kerosene	35-45	tool used.
Greens Flat (b)						Pulaski and H. K. Porter No. 2
Plot 1	6/30	105	R. roezli	Borax - Powdered	2	used depending on growth habit
2	7/1	104	R. roezli	Borax - Powdered	2 (c)	of bush.
3	7/2	102	R. roezli	Controls	-	
4	7/2	50	R. roezli	Borax - Powdered	1	

(a) Stanislaus National Forest, Strawberry region.
(b) Plumas National Forest, Spanish Ranch region.
(c) Each crown wet with two ounces water before chemical treatment.

(c) High stream use with two outlet weirs before confluence.
(2) Stream destroyed through mining region.
(3) Stream destroyed through urban region.

| | | |

Idaho

Decapitation Tests

Test plots on the decapitation treatment of upland Ribes were established in various parts of the white pine region of north Idaho. After considerable scouting work had been completed areas were located on: (a) Shanghai Ridge, Clearwater Forest; (b) the North Fork of the Coeur d'Alene River, Coeur d'Alene Forest; (c) the Coeur d'Alene River near Prichard, Coeur d'Alene Forest; (d) Santa Creek near Santa, Palouse Division of the St. Joe Forest. Tests were made on R. viscosissimum, R. irriguum, and R. lacustre in which powdered borax and ammonium thiocyanate were used as killing agents. Borax was believed to be low in toxicity but because of its cheapness and safety it was given a careful field trial. Typical problem bushes and methods of decapitating R. viscosissimum are shown in Photographs W1467 to W1470. A Pulaski, a pair of long-handled pruning shears, and a special dehorner (H. K. Porter Forester No. 2) were tested as cutting tools. The manner in which these tools were used is illustrated in Photographs W1467 to W1473. The Pulaski and pruning shears were soon found to be the most satisfactory, the former being recommended for general crew work. A summary of these experiments is given in Table No. 8.

TABLE NO. 8

DECAPITATION AND CHEMICAL TREATMENT OF

Location and Plot Number	Number Bushes Treated	Species	Chemical
Shanghai Ridge			
Plot 1			
2			
3			
4			
5			
Plot (a)	15	R. irriguum	Ammonium thiocyanate
	17	R. irriguum	Borax - Powdered
	20		Control
	32	R. viscosissimum	Powd.
	30	do	Ammonium
	21	do	Cont
	22	do	

Annual Report 1934
H. R. Offord

Decapitation Tests

Test plots on the decapitation treatment of upland Aibes were estab-

TABLE NO. 8

DECAPITATION AND CHEMICAL TREATMENT OF RIBES IN IDAHO, 1934

Location and Plot Number	Date of Treatment	Number Bushes Treated	Species	Chemical Used	Ounces Chemical Per Crown	Remarks
Shanghai Ridge (a)						
Plot 1	7/8	19	R. viscosissimum	Ammonium thiocyanate	2	Pulaski treatment.
2	7/9	34	do	do	2	Pruning shears.
3	8/9	18	do	Controls	-	Pruning shears, (15), Pulaski (3)
4	8/9	21	do	do	-	Pulaski treatment.
5	8/10	55	do	Ammonium thiocyanate	1	Pruning shears, (52), Pulaski (3)
6	8/10	30	do	Borax - Powdered	2	Pruning shears.
7	8/10	20	do	do	2*	Pruning shears.
Little North Fork (b)						
Plot 1	8/14	19	R. irriguum	Ammonium thiocyanate	2	Pulaski and pruning shears.
1	8/14	12	R. lacustre	do	2	do
2	8/15	14	R. irriguum	Borax - Powdered	2	do
2	8/15	2	R. lacustre	do	2	do
1 and 2	8/14, 8/15	15	R. irriguum	Controls	-	do
		2	R. lacustre	do	-	do
Lost Creek (c)						
Plot 3	8/16	13	R. irriguum	Ammonium thiocyanate	2	Pulaski and pruning shears.
4	8/16	17	R. irriguum	Borax - Powdered	2	do
3 and 4	8/16	22	R. irriguum	Controls	-	do
Santa (d)						
Plot 1	8/23	33	R. viscosissimum	Borax - Powdered	2	Pulaski and pruning shears.
2	8/23	25	do	do	2*	do
3	8/23	21	do	Ammonium thiocyanate	1	do
1, 2, and 3	8/23	22	do	Controls	-	do

(a) Clearwater National Forest, Pierce region.
(b) Coeur d'Alene National Forest, Honeysuckle region.
(c) Coeur d'Alene National Forest, Prichard region.
(d) Three-fourths of a mile south of Santa on Santa-Emida Highway.

* Each crown wet with two ounces water before chemical treatment.

Annual Report 1934
H. R. Offord

THE DECAPITATION AND CHEMICAL TREATMENT OF R. VISCOSISSIMUM

TYPICAL PROBLEM BUSHES, METHOD OF TREATMENT AND TYPES OF TOOLS SUGGESTED FOR FIELD USE



W-1468 Ribes viscosissimum growing out from under a down log. Bushes of this sort run up the costs of hand eradication.



W-1470 Showing the same problem as in W-1468 and a convenient way of cutting off such bushes by means of a pair of long handled pruning shears.



W-1470-1 Bush shown in W-1470 after decapitation by the pruning shears and addition of the chemical.



W-1469 Another problem frequently encountered in the eradication of upland Ribes.



W-1469-1 The clipping types of tools shown in this picture are effective weapons of eradication if followed up by application of dry chemical to the crown of the cut bushes.

THE DECAPITATION AND CHEMICAL TREATMENT OF R. VISCOSISSIMUM

TYPICAL PROBLEM BUSHES, METHOD OF TREATMENT AND TYPES OF TOOLS SUGGESTED FOR FIELD USE



W-1467-1 This bush is difficult to pull or dig because of the size and vigor of its root system.



W-1467-2 A single well placed cut with a Pulaski prepares it for chemical treatment.



W-1467-3 Note the clean cut through crown tissue. The crown has also been subjected to additional scarification by kicking it a few times with a caulked shoe.



W-1467-4 Next sprinkle over the exposed crown the dose of dry chemical. If water is available moisten the crown before adding the chemical. (2 oz. of dry powdered Borax was used on this crown.)



W-1467-5 The aerial part of the bush removed by the decapitation treatment.

THE DECAPITATION AND CHEMICAL TREATMENT OF R. VISCOSISSIMUM

TYPICAL PROBLEM BUSHES, METHOD OF TREATMENT AND TYPES OF TOOLS SUGGESTED FOR FIELD USE



W-1471 Rock bound Ribes viscosissimum such as this one run up labor costs in hand eradication. Note the position of the cutting shears below the thickened portion of the crown.



W-1471-1 Crown of bush shown in W-1471 after treatment with 2 ounces of Borax.



W-1473 Down timber lying over the lower portion of stems make difficult eradication chances. This picture shows the H. K. Porter Forester #2 in action.



W-1472 Left - regular long handled pruning shears, and right - H. K. Porter Forester #2. These tools are more effective than a Pulaski for decapitation of bushes rooted under a log or in rock crevice.

ANNUAL REPORT 1934
H.R. OFFORD

Comparative Tests on the Toxicity of Chlorate and Chlorate-Bicarbonate Mixtures

Experimental areas were located on Washington Creek and its tributaries near Camp P-269. Here field tests were conducted on the toxicity of straight sodium chlorate in comparison with that of a mixture of sodium chlorate and sodium bicarbonate. Eight plots each measuring 66 by 33 feet (one-twentieth of an acre) were staked out; four of these plots were on Ann Creek, a small side feeder of Soda Creek; one on Soda Creek, a tributary of Washington Creek; and three on Washington Creek. Each plot was subdivided into milacre sections to facilitate even application of the chemical, which was applied as a spray and soil drench with regular knapsack sprayers. The method of counting pump strokes for each milacre was found to be satisfactory for obtaining even distribution. A map was subsequently made for each plot showing the distribution of Ribes and brush, presence of windfall, and stream flow. Photographs of typical Ribes sites were also taken on each plot shortly after treatment. Treatment data are summarized in Table No. 9.

TABLE NO. 9

SPRAY AND SOIL DRENCH TESTS ON R. PETIOLARE CLEARWATER T.P.A. IDAHO, 1934

Location and Plot Number	Date of Treatment	Chemical Used	Gallons Solution Per Acre	Pounds Chemical Per Acre
Ann Creek, C.T.P.A. Plot 1	7/28	Sodium chlorate Sodium bicarbonate	1,240	600 600
Plot 2	7/30	Sodium chlorate	1,240	600
Plot 3	7/31	Sodium chlorate Sodium bicarbonate	1,040	500 500
Plot 4	7/31	Sodium chlorate	1,040	500
Soda Creek, C.T.P.A. Plot 5	8/1	Sodium chlorate Sodium bicarbonate	520	250 250
Washington Creek C.T.P.A. Plot 6	8/1	Sodium chlorate Sodium bicarbonate	840	400 400
Plot 7	8/2	Sodium chlorate	840	400
Plot 8	8/2	Sodium chlorate	520	250

Oregon

Prior to 1934 the control operations had not been faced with the necessity for eradicating extensive stands of R. cereum. Occasionally small patches or individual plants of the species had been found within control areas in California but although they were difficult and costly to remove by hand grubbing, the total number of such plants had not warranted development of special methods for their destruction.

The situation that confronted the 1934 control operation on the Rogue

Experimental areas were located on Washington Creek and its tributaries near Camp P-289. Here field tests were conducted on the toxicity of straight sodium chlorate in comparison with that of a mixture of sodium chlorate and sodium bicarbonate. Eight plots each measuring 66 by 87 feet (one-twentieth of an acre) were staked out; four of these plots were on Ana Creek, a small side feeder of Soda Creek; one on Soda Creek, a tributary of Washington Creek; and three on Washington Creek. Each plot was numbered and its boundaries were marked. The application of the chemical, which was applied as a spray and soil drench with regular knapsack sprayers. The method of counting pump strokes for each milacre was found to be satisfactory for obtaining even distribution. A map was subsequently made for each plot showing the distribution of sodium and bicarbonate of windfall, and stream flow. Photographs of typical fields sites were also taken on each plot shortly after treatment. Treatment data are summarized in Table No. 2.

Table No. 2

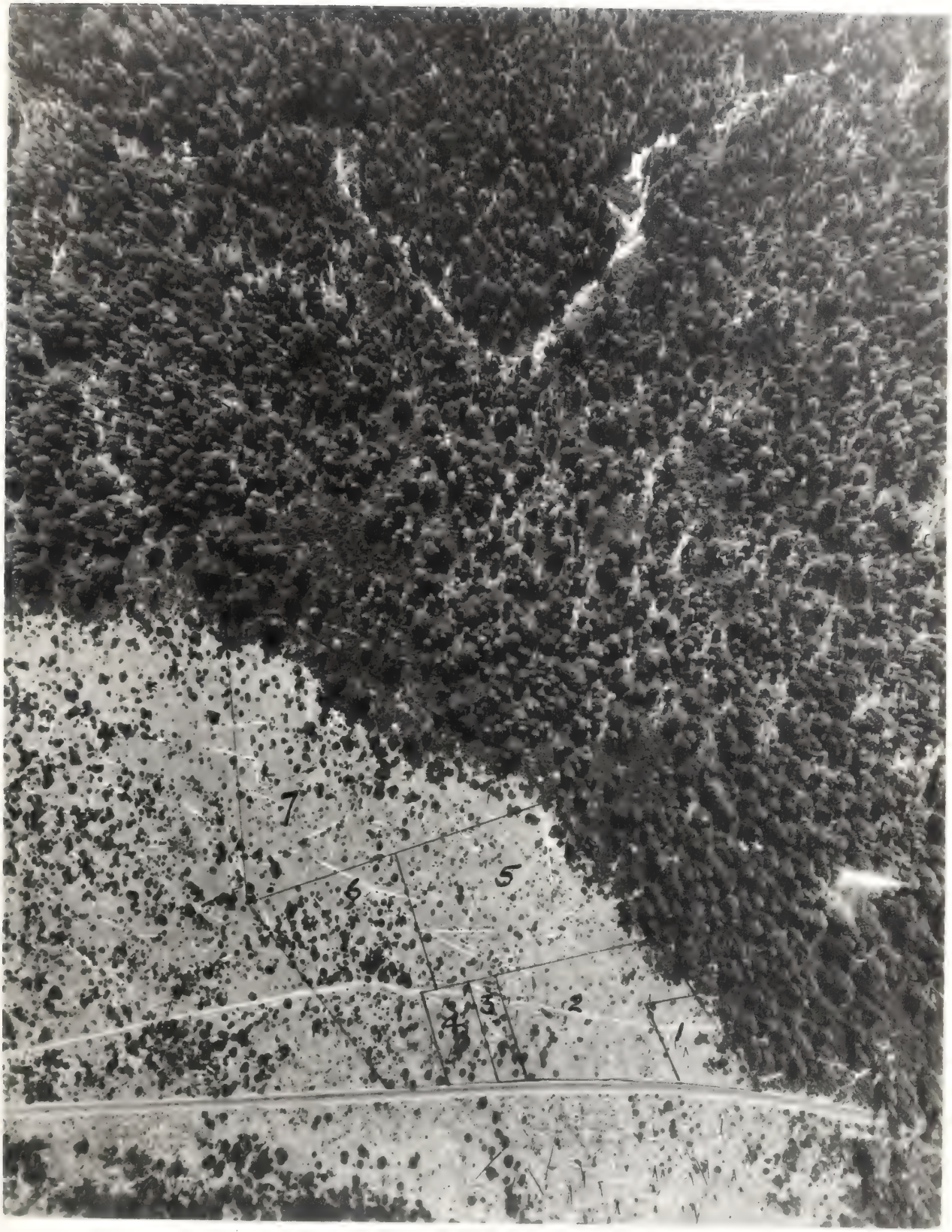
EFFECT AND COST DATA ON S. [illegible] C.T.P.A. [illegible]

Location and Plot Number	Date of Treatment	Gallons. Solution	Pounds Chemical
Ana Creek, C.T.P.A.		Sodium chlorate	
Plot 1	7/24	Sodium bicarbonate	1,344
Plot 2	7/30	Sodium chlorate	1,
		Sodium chlorate	
Plot 3	7/31	Sodium bicarbonate	1,0
Plot 4	7/31	Sodium chlorate	1,0
Soda Creek, C.T.P.A.		Sodium chlorate	
Plot 5	8/1	Sodium bicarbonate	
Washington Creek		Sodium chlorate	
C.T.P.A. Plot 6	8/1	Sodium bicarbonate	
Plot 7	8/1	Sodium chlorate	
Plot 8	8/2	Sodium chlorate	

Oregon

Prior to 1934 the control operations had not been faced with the necessity for eradicating extensive stands of R. serpens. Occasionally small patches of individual plants of the species had been found within control areas in California although they were difficult and costly to control properly, the number of such plants had not warranted territorial or intensive eradication.

The situation that confronted the 1934 control operation on the Rogue



Aerial photograph of 1934 R. cereum experimental plots, Rogue River National Forest. The lines in the print mark the boundaries of plots, the numbers of which also appear in the print. This photograph was taken after the Ribes plants had been removed from Plots 1, 2, 3, and 4. Official photograph 116th Photo Section, W. N. G.

River National Forest in Oregon was, however, quite different. There R. cereum is to be found in heavy concentrations in relatively close association with valuable pine. These dense stands of R. cereum generally occur on rather extensive openings in the timber. Usually the plants grow in large clumps free from brush of other species. It is their great size rather than any other factor that renders these plants difficult to remove, for they grow in loose pumice soil on relatively level ground. Small R. cereum plants do occur but their distribution is generally quite irregular. Stunted plants are frequently found in dense patches of several hundred. Their eradication by hand methods presents no difficult problem. When such patches are encountered, it is possible for a man to pull several hundred plants in an hour. At the beginning of the 1934 season there was, however, urgent need for the development of some method cheaper than hand grubbing for destroying large R. cereum clumps. It was for this purpose that a program of experimentation was undertaken in the vicinity of Prospect in the Rogue River National Forest.

Plots were established on the southeast side of U. S. Highway #62, three miles northeast of Union Creek and one-quarter mile southwest of Silver Creek Forest Camp. The experimental area shown in the aerial photograph which appears on the next page is on the site of a very old burn. By a rough preliminary count it was found that there was present approximately 125 large R. cereum clumps per acre. A typical clump is shown in Photograph W1357.

The experimental methods employed on the plots will now be described.

Plot 1. Individual small bushes were pulled by hand. Large bushes and clumps were first decapitated at the surface of the ground. Enough water to moister the crowns was then applied after which finely ground crystals of copper sulphate were sprinkled over the stumps of the stems. A Pulaski was used for the decapitation. The water was carried and applied with the aid of a 6-quart garden sprinkling pot. The chemical was carried in a cloth sack and dusted on by hand.

Plot 2. The small plants were hand pulled, the clumps and large bushes were decapitated as on Plot 1. Diesel oil, 27+0 Baume, was sprinkled on the stumps of the stems from a watering pot. Oil was also carried in a 10-quart bucket. The size of the crown determined the quantity of oil that was applied. The dosage rate per unit area of crown was, however, kept constant within close limits.

Plot 3. The plants were treated in the same manner as those on Plot 2 except that the quantity of Diesel oil applied to each plant was twice that applied to a plant of the same size on Plot 2.

River National Forest in Oregon was, however, quite different. There R. cerevm is to be found in heavy concentrations in rich alluvial soil. These dense stands of R. cerevm practically monopolize the timber. Usually the plants grow in large clumps free from brush of other species. It is their great size rather than any other factor that renders these plants difficult to treat. For they grow in dense pure stands of practically ground. Small R. cerevm plants do occur but their distribution is generally quite irregular. Stunted plants are frequently found in dense patches of several hundred. Their eradication by hand methods presents no difficult problem. When such patches are encountered, it is possible for a man to pull several hundred plants in an hour. At the beginning of the 1934 season there was, however, urgent need for the development of some method cheaper than hand grubbing for destroying large R. cerevm clumps. It was for this purpose that a number of experiments were made in the vicinity of Prospect in the Rogue River National Forest.

Plots were established on the southeast side of U. S. Highway #62, three miles northeast of Union Creek and one-quarter mile southwest of Silver Queen Forest Camp. The experimental area lies in the virgin ponderosa pine stand on the next page in an area of a very old burn. By a rough preliminary count it was found that there was present approximately 150 large R. cerevm clumps per acre. A typical clump is shown in Photograph M1587.

The experimental methods employed on the plots will now be described.

Plot 1. Individual small bushes were pulled by hand. Large bushes and clumps were first decapitated at the surface of the ground. Enough water to moisten the crowns was then applied after which finely ground crystals of copper sulphate were sprinkled over the stumps of the stems. A Polaski was used for the decapitation. The water was carried and applied with the aid of a 5-quart garden sprinkling pot. The chemical was carried in a cloth sack and dusted on by hand.

Plot 2. The small plants were hand pulled, the clumps and large bushes of the stems from a watering pot. Oil was also carried in a 10-quart bucket. The per unit area of crown was, however, kept constant within close limits.

Plot 3. The plants were treated in the same manner as those on Plot 2. to a plant of the same size on Plot 2.



W. 1357. A typical R. cereum clump in the Rogue River National Forest, Oregon.



W. 1358. Mass of large roots surrounding the crown of the R. cereum clump shown in W. 1357.

Plot 4. The small plants were pulled by hand, the clumps and large plants were decapitated as on Plots 1, 2, and 3, but no chemical was applied to the decapitated crowns.

Plot 5. Diesel oil was sprinkled upon the crowns of the intact clumps and large plants. Oil was applied at the same basic dosage rate as on Plot 2. The small plants were pulled by hand.

Plot 6. The clumps and large plants were sprayed with Diesel oil with the aid of a knapsack sprayer. The small plants were hand pulled.

Plot 7. This plot was laid out and worked with the aid of a team of horses by the eradication unit under the direction of C. F. Wessels. An account of the experiment is given in the section of the annual report dealing with Ribes eradication in Oregon. Throughout the conduct of the experimental work records were kept of the time spent on the various operations and the quantities of materials used. This was done to gain some idea of comparative costs.

The plot treatment records are presented in Table No. 10.

Plot 4. The small plants were pulled by hand, the clumps and large plants were decapitated as on Plots 1, 2, and 3, but no chemical was applied to the decapitated crowns.

Plot 5. Diesel oil was sprinkled upon the crowns of the intact clumps and large plants. Oil was applied at the same basic dosage rate as on Plot 2. The small plants were pulled by hand.

Plot 6. The clumps and large plants were sprayed with diesel oil with the aid of a knapsack sprayer. The small plants were hand pulled.

Plot 7. This plot was laid out and worked with the aid of a team of horses by the eradication unit under the direction of C. P.Wessels. An account of the experiment is given in the section of the annual report dealing with Rices eradication in Oregon. Throughout the conduct of the experimental work records were kept of the time spent on the various operations and the quantities of materials used. This was done to gain some idea of comparative costs.

The plot treatment records are presented in Table No. 10.

TABLE NO. 10

PLOT EXPERIMENTS CONDUCTED IN ROGUE RIVER NATIONAL FOREST, OREGON 1934

Plot No.	Plot Area Acres	Number Large Clumps Treated	Number Small Plants Pulled	Chemical Used		
				Kind	Quantity Total	Quantity Average Per Clump
Ribes cereum						
1	0.65	140	N.R.	Water Copper sulphate	12 Gallons 50 Pounds	0.09 Gallons 0.36 Pounds
2	2.72	600	673+	Diesel oil	222 Gallons	0.37 Gallons
3	0.33	107	39+	Diesel oil	88 Gallons	0.82 Gallons
4	0.44	69	691	Diesel oil		
5	3.76	512	55	Diesel oil	297 Gallons	0.58 Gallons
6	3.04	532	837	Diesel oil	138 Gallons	0.26 Gallons
7	See "Ribes Eradication in Oregon" for Data					
Ribes binominatum						
	Sq. Yds.	Area Treated				
8	248	73 Sq. Yds.		Diesel oil	54 Gallons	

N. R. Not recorded

Plot No.	Plot Area (Acre)	Number Treated (Large Small)	Type Treatment	Spray Oil Average Per Tree	Spray Mix Average Per Tree
Tribes cayeum					
1	0.55	183	C.P.	Copper sulphate	50 Pounds
2	2.76	460	C.P.	Diesel oil	12 Gallons
3	0.52	107	C.P.	Diesel oil	50 Pounds
4	0.44	69	Sin.	Diesel oil	
5	1.72	345	C.P.	Diesel oil	47 Gallons
6	3.04	572	Sin.	Diesel oil	128 Gallons
7	See "Tribes Eradication in Oregon" for Data				
Tribes dinominatum					
8	248	72	Sin. Yds.	Diesel oil	54 Gallons
		Area Treated Sq. Yds.			

N. R. Not recorded

TABLE NO. 10 (Continued)

PLOT EXPERIMENTS CONDUCTED IN ROGUE RIVER NATIONAL FOREST, OREGON 1934

Plot No.	Man Time				
	Decapitation Includes Pulling		Chemical Application		Average Total Minutes Per Large Clump
	Total	Average Minutes Per Large Clump	Total	Average Minutes Per Large Clump	
	Ribes cereum				
1	4 hrs. - 33 min.	1.95	2 hrs. - 5 min.	1.12	3.07
2	17 hrs.- 52 min.	1.79	9 hrs. - 7 min.	0.91	2.70
3	2 hrs. - 47 min.	1.58	3 hrs. - 23 min.	1.34	2.92
4	2 hrs. - 33 min.	2.22			2.22
5			6 hrs. - 16 min. includes pulling	0.73	0.73
6			19 hrs. - 41 min. includes pulling	2.12	2.12
	Ribes binominatum				
	N.R.				

N. R. Not recorded.

Place No.	Recommendations Incomplete	Mean Time Between Failures		
	Total	Average Minutes per Pump	Chemical Emulsion Total	Chemical Emulsion Average Minutes per Pump
1	4 hrs. - 32 min.	1.41	2 hrs. - 0 min.	1.12
2	17 hrs.- 52 min.	1.77	9 hrs. - 7 min.	2.37
3	2 hrs. - 47 min.	1.38	3 hrs. - 22 min.	1.14
4	2 hrs. - 23 min.	1.22		
5			5 hrs. - 10 min. Includes pulling	3.73
6			13 hrs. - 41 min Includes pulling	2.12

N. R.

N. R. Not recorded.

Before the end of the season it was possible to reach fairly definite conclusions regarding the relative merits of some of the methods tried on the experimental area. Copper sulphate was found to be quite definitely ineffective. Decapitation without chemical treatment also failed to kill the plants. The Diesel oil treatments that followed decapitation showed every indication of proving exceedingly effective. Calculation shows that the cost of this type of treatment if conducted upon a control operations basis would be surprisingly low. The average man time required to decapitate a R. cereum clump was found to be only 1.6 minutes and the time required to apply the oil even with the crude equipment used amounted to only slightly more than one-half of the decapitation time. By using a mule to assist in the distribution of the oil one man could probably treat all the clumps decapitated by a three-man cutting crew. Thus, the crew output would be in the neighborhood of 225 clumps plus an indeterminate number of small plants per man-day. At that rate crews could work over nearly two acres per man day in territory similar to the experimental area. The oil used is readily available and costs comparatively little. Fortunately many of the R. cereum sites are readily accessible by motor truck so that haulage is not a prohibitive factor in the use of the method. The labor employed on the experimental work was undeniably better than average grade and consequently the production estimates based upon this work are probably high, but even at its worst the method would without doubt be superior to hand grubbing alone. This is indicated by the fact that it took a crew of three practiced men working rapidly approximately five minutes to grub an average clump. The outcome of experiments in which oil was applied to the intact plants is still doubtful, but appearances indicate that the treatments were not as effective as application of oil to decapitated crowns.

At the suggestion of the eradication unit a test was made of the effectiveness of Diesel oil as an herbicide upon R. binominatum. Plants of this species are characteristically of prostrate growth habit. They layer profusely and in certain localities form a mat of roots and stems carpeting the soil. A plot was established opposite the Hamaker Guard Station on the old Diamond Lake Road two miles from its junction with the new Diamond Lake Highway. Coarse debris was first removed from the plot. Oil was applied uniformly to the surface of the ground covered by the plants. A garden sprinkling pot was used to distribute the oil at the rate of approximately three-quarters of a gallon per square yard. It is doubtful that even this quantity will prove sufficient and it is almost certain that the dosage rate could not be materially lowered without destroying the effectiveness of the treatment. Unlike R. cereum, R.binominatum is generally found in localities greatly removed from motor transportation. This means that haulage costs would be prohibitive in many cases. It is not likely that this method for destroying R. binominatum plants will prove practical.

D. GROSS MORPHOLOGY OF STEM AND ROOT SYSTEMS OF CALIFORNIA RIBES

Introduction

Field work on the gross morphology of Ribes roots was continued during part of the season of 1934, with the establishment of two plots for the study of California Ribes. The methods of collecting data were the same as those described in the 1933 annual report, pp. 259, 262, and 263. The few data herein presented are rendered more significant by their agreement with previous experience in the collection of root samples of R.roezli for starch and tannin analyses (1930) and with observations of the R. inerme slashing crews on the Plumas Forest (1934).

Before the end of the season it was possible to reach fairly definite conclusions regarding the relative merits of some of the methods tried on the experimental area. Copper sulphate was found to be quite satisfactorily ineffective. oil treatments that followed decomposition showed every indication of proving exceedingly effective. Calculation shows that the cost of this type of treatment is considerably less than a control practice would be, The crew age man time required to decapitate a R. cereum clump was found to be only 1.6 minutes to only slightly more than one-half of the decapitation time. By using a mule to assist in the distribution of the oil, one man could probably treat all the clumps decapitated by a three-man crew. These two crews in the heaviest section of the clump pl[illegible] man-day. At that rate crews could work over nearly two acres per man day in territory similar to the experimental area. The oil used is readily available and costs comparatively little. Furthermore many of the R. cereum clips in the area of the valley are within reach of a pipeline. Costs in the use of the method. The labor employed on the experimental work was undeniably better than average grade and consequently the production estimates based upon this work are probably high. But even at its worst the method would without doubt be superior to hand grubbing alone. This is indicated by the fact that it took a crew of three men a day to grub a clump. The outcome of experiments in which oil was applied to the intact plants is still doubtful, but appearances indicate that the treatments will be effective on application of oil to decapitated crowns.

At the suggestion of the eradication unit a test was made of the effectiveness of Diesel oil as an herbicide upon R. fruticosum. Plants of this species are characteristically of prostrate growth habit. They layer profusely and in certain localities form a mat of roots and stems carpeting the soil. A plot was established opposite the Hamaker Guard Station on the old Diamond Lake Road two miles from its junction with the new Diamond Lake Highway. Coarse debris was first removed from the plot. Oil was applied uniformly to the surface of the ground the rate of approximately three-quarters of a gallon per square yard. It is doubtful if the dosage rate could not be materially lowered without destroying the effectiveness of the treatment. Unlike R. cereum, R. binominatum is generally found in localities greatly removed from motor transportation. This means that haulage costs would be prohibitive in many cases. It is not likely that [illegible] R. binominatum plants will ever pose [illegible].

D. GROSS MORPHOLOGY OF STEM AND ROOT SYSTEMS OF CALIFORNIA RIBES

Introduction

Field work on the gross morphology of Ribes roots was continued during [illegible] of the season of 1928, with the assistance of Paul Plotz [illegible] California Ribes. The methods of collecting data were the same as those described in the 1927 annual report, pp. 241 and 242. The [illegible] previously [illegible] were supplemented by their experience in the collection of root samples of R. roezli for stereo and tannin analyses (1930) and with observations of the R. inerme [illegible] Pinnae (1931).

Description of Plots and Bushes

Plot E:

This plot of Ribes roezli Regel was located in the Grizzly Meadow area of the Stanislaus Forest, California, near the intersection of the North Fork of Griswold Creek and the new Forest Service road to Skull Creek. The plot was on a gentle southerly slope east of the break to the creek, at an elevation of about 5,400 feet. The area was well stocked with a mixed-age stand of sugar pine white fir, and a small amount of yellow pine. Ribes occurred in the rather infrequent openings of the timber in this unlogged area. A few bushes of Ceanothus cordulatus Kell., a low Symphoricarpos, and a sparse growth of annuals also occurred in the openings. The Ceanothus plants were declining; they were either being shaded out by the forest, or were suffering from severe root competition with the trees, especially the white fir reproduction. The surface soil was friable, loose and became very dry in the late summer and fall.

Bush E-1. This plant was a vigorous specimen situated in a small opening near a group of white fir. The roots were entangled with those of white fir reproduction. Excavated 5/30/34.

Bush E-2. This bush grew among 12 to 20-foot sapling white firs. The plant was small, not overly vigorous, with leaves relatively thin and few. Its location is similar in many ways to the habitat of bush B-3, R. inerme (Idaho). Excavated 6/1/34.

Bush E-3. The habitat of this bush was slightly more open, and was sunny from about 11 a.m. to 4 p.m. The bush was large and in good vigor, and showed more than the usual amount of 1 and 2-year old wood. Excavated 6/2/34.

Plot F:

This plot of R. inerme Rydb., was located in the Meadow Valley Area of the Plumas Forest, California and was exposed to direct but intermittent sunlight. The plants selected for study were located near the lower limit of the heavy willow-inerme thicket on the upper end of Little Schneider Meadow. The meadow was uneven, due to deposition of sediment, and not particularly grassy. The surface soil was very poor in organic matter, and at a depth of two or more inches contained a high percentage of clay. In places the brush grew in clumps, and in others was thin and scattered. The meadow had been heavily grazed for a long time. The brush in the meadow was showing damage from repeated dry seasons, and the R. inerme chosen for study appeared to have been at one time larger and more vigorous.

Bush F-1. This bush was upright, straggly, fairly vigorous, had relatively few leaves and little current season stem, and was typical of dry, open habitat. The surface soil was dry and the underlying stratum was of poor quality. Excavated 7/6/34.

Bush F-2. This was a small, slow-growing bush of only fair vigor, situated on the edge of a clump of willows, and consequently subjected to considerable shade. The plant had sprouted from a layering stem, but the connecting stem had rotted away. Excavated 7/7/34.

Description of Plots and Burns

Plot E:

This plot of Ribes roezlii Regel was located in the Grizzly Meadow Area of the Plumas Forest, California, near the intersection of the Bucks Lake Grizzly Meadow Creek and the new Forest Service road to Small Creek. The plot was on a gentle southerly slope east of the brook to the creek, at an elevation of about 5,400 feet. The area was well stocked with a mixed-age stand of sugar pine white fir, and a small amount of yellow pine. Ribes occurred in the rather infrequent openings of the timber in this locality. A few bushes of Ceanothus cuneatus Hook. were present, but a scarce growth of shrubs also occurred in the forest, or were replacing long brush complexes with the rarely occurring wax white fir species. The dominant plants were deciduous, they were either badly damaged by the forest, or were replacing long brush complexes with the rarely occurring wax white fir species. The dominant plants were deciduous, they become very dry in the late summer and fall.

Burn E-1. This plant was a vigorous specimen situated in a small open spot in a stand of white fir. The roots were entangled with those of white fir reproduction. Excavated 8/30/24.

Burn E-2. This bush grew among 12 to 20-foot seedling white fire. The plant was small, but overly vigorous, with leaves relatively thin and flat. Its location is similar in many ways to the habitat of Ribes lentum (Lindl.) Excavated 8/1/24.

Burn E-3. The habitat of this bush was slightly more open and was sunny from about 11 a.m. to 4 p.m. The bush was large and in good vigor, and seemed more than the usual amount of 3 and 5-year old wood. Excavated 8/21/24.

Plot F:

This plot of R. lentum Rydb., was located in the Meadow Valley Area of the Plumas Forest, California and was exposed to direct sun intermittent sun light. The plants selected for study were found along the lower limit of the heavy willow-lentum thicket in the moist and of little Seymour Meadow. The meadow was uneven. Due to tunneling of animals and not infrequently grazing, the surface soil was very poor in organic matter, and at a depth of ten or more inches contained a high percentage of clay. In places the brush grew in clumps, and in others was thin and scattered. The weeds had been heavily grazed for a long time. The bush in the meadow was showing damage from repeated dry seasons, and vigorous.

Burn F-1. This bush was upright, strongly, fairly vigorous, had relatively few leaves and little current season also, and was injured at its base. The soil was light. The surface soil was dry and the underlying stratum was at least quality. Excavated 7/6/24.

Burn F-2. This was a small, vine-growing bush of only five years old on the edge of a clump of willows and consequently subjected to partial shade. The plant had extended from a large plot but the connecting root was rotting away. Excavated 7/7/24.

Bush F-3. This was a large, upright, and arching bush with relatively few vigorous branches or leaves, growing more in the open than F-1. All three bushes of Plot F were fruiting very lightly, although there were abundant fruits on bushes in the adjacent willow thickets, where the habitat was moister and shadier. Excavated 7/9/34.

Presentation of Summarized Data

Table No. 11 records important items of data for the individual bushes studied. Table No. 12 concerns plot averages. Plate 1 shows vertical profiles of the six excavated bushes, Plate 2 illustrates the depth distribution of their roots and Plate 3 describes the general soil conditions.

Discussion

The summarized data for the California Ribes may profitably be compared with the 1933 data on Idaho plants. Although the 1934 work comprised the study of only a small number of bushes, the data are in close agreement with general observations of previous years. The conclusions on R. inerme would have been more positive if time had been available for the establishment of a plot in heavier brush and moister soil. However, observation of the work of "slashing" crews in areas of heavy brush and moist soil provided a basis for general information on bushes of this habitat.

Under the ecological conditions described for Plot E, the average depth of R. roezli roots was 9.6 inches and the diameter of root distribution at the three-inch level was 97 inches. Both of these figures indicate that R. roezli is the type of plant that requires heavy dosages of chemical to ensure perfect kill. This deduction is corroborated by the data for spray and soil drench treatments shown in Table No. 1. Moreover, R. roezli does not have the collar, or fringe, of small roots about its crown as do the Idaho plants of moist habitat. The absence of this mass of fibrous roots renders R. roezli less susceptible to a surface drench of chemical, and lends further weight to the practicability of the decapitation method as a logical mode of attack.

In Plot E extensive lateral spread of Ribes roots occurred in the first three inches of soil when the Ribes were in close proximity to other large perennials. Apparently increased shade, root competition and thick duff are factors contributing to the formation of a widespreading and shallow root system for R. roezli.

Plot F, the 1934 plot of R. inerme, is most nearly comparable to Plot 5 of the 1933 R. inerme work. Location #11 (1933), report of March 21, 1933, was also a dry, open habitat. Under similar ecological conditions there seems to be no great difference in root distribution of California and Idaho R. inerme. The fringe of small roots about the crown was invariably found on R. inerme in moist, shady habitats of California, but was poorly developed on the plants of dry location.

During the latter part of the 1934 field season studies were made on the rate of transpiration of California Ribes and of several associated species of brush. Wood densities were determined concurrently, and leaf area collections were made. Due to supervision of a recent two months' SERA project in the Ribes garden at Berkeley, the laboratory work on these investigations has not been completed, and no report can be made at present.

Brush T-3. This was a large, upright, and arching bush with relatively
bunches of Plot T were fruiting very lightly, although there were abundant fruits
on bushes in the adjacent alluvial bottom, mostly [illegible]
shelter. Excavated 7/8/58.

Presentation of Data

Table No. 11 records important items of data for the individual bushes
studied. Table No. 12 summarizes plot averages. Plate 3 shows average values of
the root characteristics. Plate 4 illustrates the soil characters at the
and Plate 5 describes the general soil conditions.

Discussion

The summarized data for the California Ribes may profitably be compared
with the data on Index plants. Although [illegible] only a small number of bushes the ones here represented will generally
sections of previous years. The conclusions on R. tenuis would have been more
valuable if time had been available for the [illegible] of a [illegible]
area and material soil. However, observations at the edge of [illegible]
types of Lassen brush and soil provided a basis for general information on
bushes of this habitat.

Under the ecological conditions described for Plot M, the average depth
of R. roezli roots was 9.6 inches and the diameter of root distribution at the
three-inch [illegible] was 17 inches. Both of these figures indicate fairly
the type of plant that requires heavy reserve of moisture to mature perfect fruit.
This deduction is corroborated by the data for spray and soil drench treatments
shown in Table 10. Moreover, R. roezli does not have the coiled, or fibrous, or
small roots about its crown as do the Idaho plants of moist habitat. The absence
of this type of fibrous roots restricts R. roezli [illegible] to a surface feed
of moisture, and lends further weight to the practicality of the [illegible]
method as a logical mode of attack.

In Plot S extensive leaders spread at right [illegible] observed in the [illegible]
three inches of soil where the Ribes were in close [illegible] to other large plants.
Adventitious [illegible] roots [illegible] and thick buff [illegible]
contributing to the formation of a widespreading root system for R.
roezli.

Plot T, the 1934 plot of R. tenuis, is most nearly comparable to Plot C
of the 1933 R. lacustre work. Section VII [illegible], report of Plot VI, 1934,
also a dry, open habitat. Under similar environmental conditions there seems to be
no great difference in root distribution of California and Utah R. lacustre. The
fringe of small roots around the crown was investigated found on R. lacustre in
other localities of California, but was rarely developed on the plants of the loca-
tion.

During the latter part of the 1934 field season studies were made on the
rate of transpiration of California Ribes and of several associated species of
trees. Some determinations were started on a leaf area basis, but were
made. Due to supervision of a recent two months' SCSA project in the Ribes garden
at Berkeley, the laboratory work has been interrupted, and the
report can be made at present.

TABLE NO. 11

ROOT DATA FOR CALIFORNIA RIBES. 1934 PLOTS.

Serial No. of Excavated Bush	Species	Age of Bush in Years	Live Stem of Bush in Feet	Average Live Stem Per Year of Age in Feet	C.S.S. Ratio. Current Season Stem Over Live Stem Percent	Diameter of Root System in First 3" of Soil in Inches	Average Depth of Roots Below Soil Surface in Inches	Deepest Root Below Surface in Inches	Percent of Plotted Root Points in First 6" of Soil	Percent of Plotted Root Points Below 24" of Soil
E-1	R. roezli	6	52	9	19	84	12.0	42	26	9.7
E-2	do	9	15	2	8	57	6.2	27	68	1.1
E-3	do	8	75	9	16	150	10.5	51	36	6.8
E	Average	8	47	7	14	97	9.6	40	44	5.9
F-1	R. inerme	5	27	5	22	54	3.7	15	80	0.0
F-2	do	6	19	3	7	42	3.2	18	95	0.0
F-3	do	10	87	9	18	75	3.8	21	85	0.0
F	Average	7	44	6	16	57	3.2	18	87	0.0

Note: In Table No. 16, Annual Report 1933, p. 272, comparable data may be found for R. petiolare and R. inerme - Plots A, B, C, and D.

TABLE NO. 11

FOOT DATA FOR CALIFORNIA RISES. 1954 PILOT.

| | | |

TABLE NO. 12

CALIFORNIA ROOT DATA BY PLOT AVERAGES

Morphologic Characters Studied			Plot E. R. roezli	Plot F. R. inerme
Age of the bushes in years.			8	7
Number of main stems from crown.			11	9
Current Season Stem	Number of current season stems.		54	27
	Average length C.S.S., in inches.		2.7	3.6
	Longest C.S.S., in inches.		11	11
	Total length C.S.S., in feet		7.7	7.5
C.S.S. ratio: C.S.S. over total live stem of bush			14	16
Live stem older than C.S.S., in feet.			40	37
Total feet of live stem, C.S.S. and older.			47	44
Growth rate; average feet live stem per year of age.			6.6	5.8
Estimated feet dead stem per bush.			18	22
Number of fruiting spurs per bush.			350	152
Highest stem tip of bush, inches.			30	30
Roots	Deepest root; inches below soil surface.		40	18
	Average depth of plotted roots recorded; inches below soil surface.		9.6	5.2
	Diameter of root system in first 3 in. soil.		97	57
Depth distribution of roots. Percentages of plotted roots occurring in the horizontal depth layers as given.		0 to 3 inches.	31	65
		3 to 6 "	12	22
		0 to 6 "	44	87
		6 to 9 "	13	7
		9 to 12 "	11	4
		12 to 24 "	28	2
		24 to 36 "	5	0
		Below 36 "	1	0

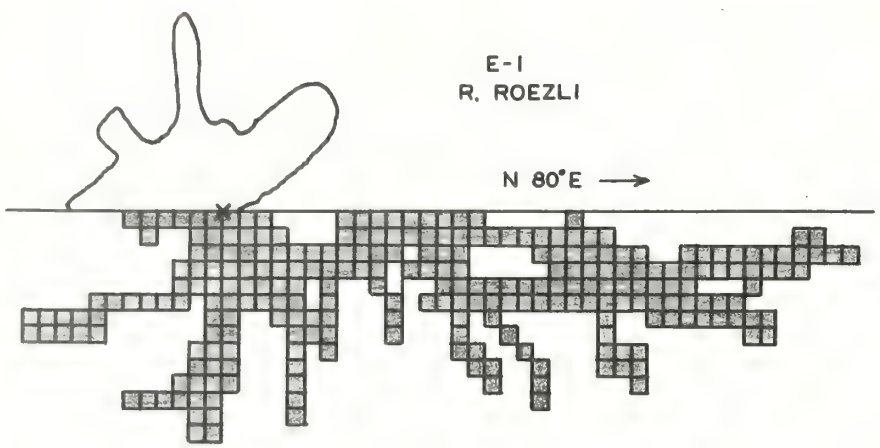
TABLE NO. 12

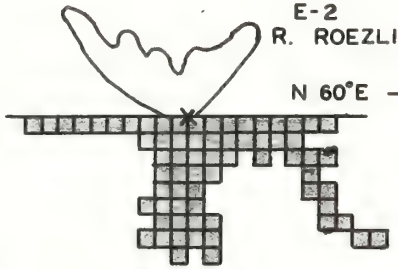
Differences more marked at later stages

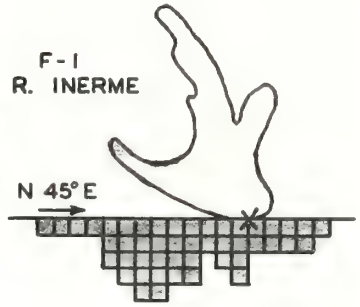
		Plot X.	Plot ..
Canes	Number of canes per plot.	5	7
	Number of main stems.	41	6
	Number of canopy spring stems.	36	36
	Average length O.S.S., in inches.	7	6.5
	Longest O.S.S., in inches.	13	11
	Total length O.S.S. in feet	7.7	5.5
C.L.S.	C.L.S. prefix: O.S.S. over total live stem of bush.	11	13
	Five stem older than O.S.S., in feet.	4	2
	Total feet of live stem. O.S.S. and older.	7	4
	Average C.L.S. prefix: Total live stem per plot.	1.8	1.2
	Difference, C.L.S. and O.S.S.	1	2
	Number of fruiting canes per bush.	3	4
	Highest stem tip of bush, inches.	5	5
Roots	Deepest root; inches below soil surface.	40	18
	Average depth of plotted roots recorded; inches below soil surface.	9.6	8.2
	Diameter of root system in first 8 in. soil.	57	57
Depth distribution of roots. Percentages of plotted roots occurring in the horizontal depth layers as given.	0 to 3 inches.	23	66
	3 to 6 "	3	2
	6 to 9 "	24	17
	9 to 12 "	11	7
	12 to 24 "	25	6
	24 to 36 "	5	2
	Below 36 "	1	0

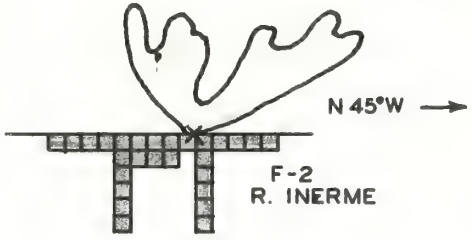
PLATE I. DIAGRAMS OF PROFILES OF RIBES BUSHES

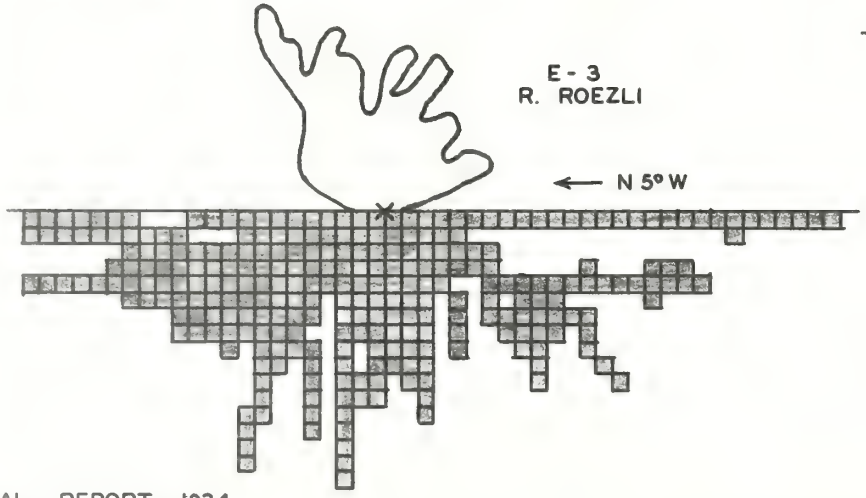


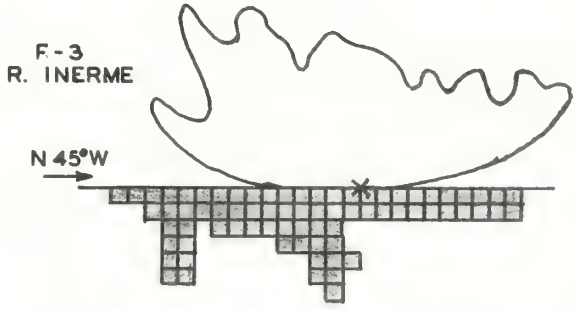








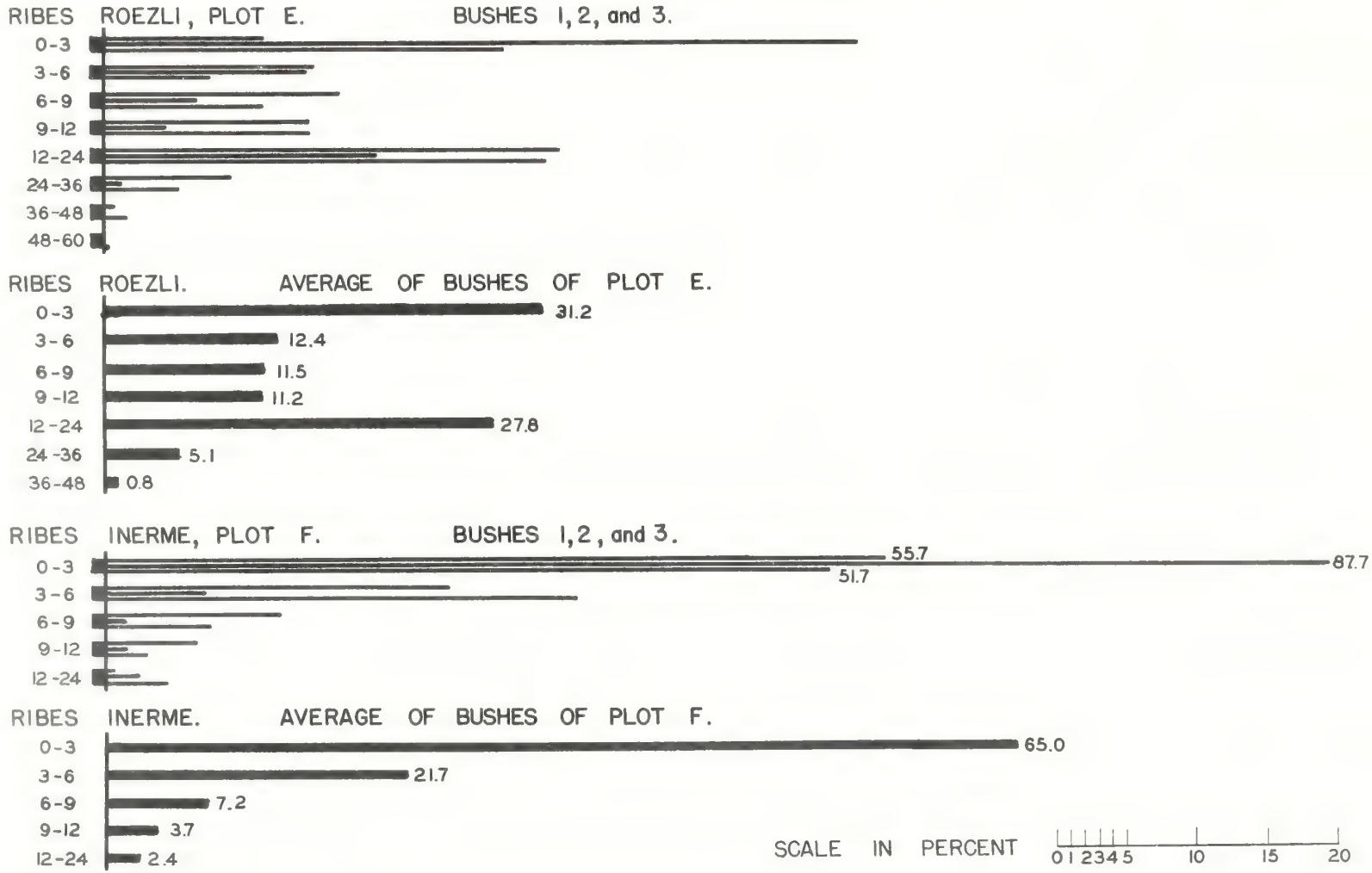




ANNUAL REPORT 1934
C. R. QUICK

PLATE 2

PERCENTAGE DISTRIBUTION OF ROOTS BY DEPTH LAYERS



ANNUAL REPORT 1934 C. R. QUICK

PLATE 3 SOIL PROFILE DIAGRAMS

VERTICAL SCALE IN FEET



LEGEND



BUSH E-1



BUSH E-3



BUSH F-2

BUSH F-1





BUSH F-3



ANNUAL REPORT 1934
C. R. QUICK

E. RECOMMENDATIONS FOR THE USE OF CHEMICALS IN RIBES ERADICATION

Idaho

R. petiolare and R. inerme. As recommended in the 1933 annual report.

R. viscosissimum, R. lacustre, and R. irriguum (large individual bushes which cannot be eradicated by pulling or grubbing). Decapitate at ground level with a Pulaski, or pruning shears, and apply two ounces of dry ammonium thiocyanate to the scarified crown.

Oregon

R. cereum. Cut off large clumps at ground level and drench crown and soil about crown with Diesel oil. The dosage of Diesel oil should average about 0.3 gallons per large bush or aggregate of bushes.

California

R. cereum. As recommended for R. cereum in Oregon.

R. roezli and R. nevadense. Decapitate large individual bushes as recommended for R. viscosissimum. Apply two fluid ounces of Diesel oil per crown or two ounces dry ammonium thiocyanate.

The effectiveness of ammonium thiocyanate and Diesel oil on decapitated bushes has been fully demonstrated in plot studies. It remains for methods tests to determine if the chemical treatment is cheaper than grubbing. Equipment for carrying and vending dry and liquid chemical must also be developed.

F. OUTLINE OF LABORATORY WORK FOR THE WINTER OF 1934-35.

1. Development of a thiocyanate formula satisfactory for use as a dry chemical in the eradication of upland Ribes. (Offord)

2. Comparison of the stability of sodium chlorate, sodium chlorate plus sodium bicarbonate, and Atlacide, in typical R. inerme soils of north Idaho. Chemical analysis will be correlated with growth data for test plants such as oats or barley. (d'Urbal)

3. Determination of the residual effect of sodium chlorate, sodium arsenite, and ammonium thiocyanate in soil samples collected from plots at Blewett Pass, Washington. (d'Urbal)

4. Investigation of the reactions between sodium chlorate and freshly expressed sap of Ribes. (Van Atta)

5. Continuation of studies correlating solar light values and the combustibility of chlorate-organic mixtures. (Van Atta)

6. Development of technique for making a satisfactory differentiation between brown and green colors in the printing of blister rust pictures. (Van Atta)

3. RECOMMENDATIONS FOR USE OF CHEMICALS IN THE INFECTION

Idaho

T. petiolare and *R. interna*. As recommended in the 1937 annual report.

R. vitacolossima, *R. lacunata*, and *T. intricata* (large individual specimens which cannot be eradicated by pulling or grubbing). Precipitate at ground level with a Pulaski, or pruning shears, and apply two ounces of dry ammonium thiocyanate to the scarified crown.

Oregon

R. cerewn. Cut off large clumps at ground level and drench crown and soil about crown with Diesel oil. The dosage of Diesel oil should average about 3.5 gallons per large bush or aggregate of bushes.

California

R. cerewn. As recommended for *R. cerewn* in Oregon.

R. rosaii and *R. nevadense*. Precipitate large individual bushes as recommended for *R. vitacolossima*. Apply two fluid ounces of Diesel oil per crown or two ounces dry ammonium thiocyanate.

The effectiveness of ammonium thiocyanate and Diesel oil on precipitated bushes has been fully demonstrated in plot studies. It remains for methods tested to determine if the chemical treatment is cheaper than grubbing. Equipment for carrying and vending dry and liquid chemical must also be developed.

E. OUTLINE OF LABORATORY WORK FOR THE WINTER OF 1937-38.

1. Development of a thiocyanate formula satisfactory for use as a dry chemical in the eradication of upland Ribes. (Offord)

2. Comparison of the toxicity of sodium chlorate, sodium chlorate plus sodium bicarbonate, and Atlacide, in typical *T. ingrua* soils of north Idaho. Chemical analysis will be correlated with growth data for test plants such as oats or barley. (L'Ormel)

3. Determination of the residual effect of soil sc chlorate, sodium arsenite, and ammonium thiocyanate in soil samples collected from plots at Hewett Pass, Washington. (L'Ormel)

4. Investigation of the reactions between sodium chlorate and freshly expressed sap of Ribes. (Van Atta)

5. Continuation of studies correlating solar light values and the combustibility of chlorate-organic mixtures. (Van Atta

6. Development of technique for making a satisfactory differentiation between brown and green colors in the printing of oilster rust pictures. (Van Atta)

7. Continuation of studies on the germination of Ribes seeds with special attention to the influence of rapid alternation of temperature above and below zero degrees Centigrade. (Quick and Van Atta)

8. Greenhouse experiments in the testing of new chemical formulae for the destruction of Ribes. (Offord et al)

9. Study of the mechanism of the toxicity of ammonium thiocyanate to plant life, by determining the effect of NH_4CNS, $(NH_4)_2SO_4$, KSCN, and K_2SO_4 on protoplasmic streaming, coagulation of protoplast and exosmosis of chloride from vacuolar sap. (Offord)

10. Transpiration studies on R. roezli, R. inerme, and R. petiolare. (Quick)

7. Continuation of studies on the germination of Xibes seeds with special attention to the influence of rapid alternation of temperature above and below zero degrees Centigrade. (Quick and Von Abbe).

8. Greenhouse experiments in the testing of new chemical formulae for the destruction of mites. (Clifford et al)

9. Study of the mechanism of the toxicity of ammonium thiocyanate to plant life, by determining the effect of NH_4CNS, $(NH_4)_2SO_4$, NaCN, and K_2SO_4 on protoplasmic streaming, coagulation of protoplast and exosmosis of chloride from vacuolar sap. (Crafts)

10. Transpiration studies on R. rosmifolius, R. laxiflorus, and R. petiolaris. (Quick)

PROGRESS REPORT OF STUDIES IN EFFECTIVENESS OF CONTROL 1934

By
E. L. Joy
Associate Forester

INTRODUCTION

It has been proven that the removal of all Ribes from within and near stands of white pine gives absolute protection to such stands from the invasion by white pine blister rust, or from the further intensification of the disease which has become established within the stands prior to the eradication of the Ribes. The most efficient practical Ribes eradication methods, when employed to protect vast acreages of white pine, do not result in the removal of every Ribes bush and new Ribes bushes from seed usually follow a disturbance of sites on which Ribes grew. Therefore, it is obvious that satisfactory protection can not be afforded stands of white pine until at least portions of such stands have been worked several times within a period of several years. However, it is known that present Ribes eradication methods result in the removal of most of the original bushes and therefore give a degree of protection to the adjacent white pines. It is essential that this degree of protection be evaluated over a period of years in order to ascertain the effectiveness of the Ribes eradication work in controlling white pine blister rust.

Although protection to stands of white pine is a result of the eradication of Ribes, the degree of protection must be measured in terms of the infection resulting from quantities of Ribes remaining or developing after the eradication work. Two general lines of study are being followed to provide the required information. They are (1) Study of the growth and regeneration of Ribes following Ribes eradication work and (2) Study of the effect of known amounts of Ribes per acre in spreading and intensifying blister rust.

The study of the growth and regeneration of Ribes, which has been carried on in stream type only, is conducted on representative sample plots established in 1929, 1930 and 1931 in 14 drainages. The effect of known amounts of Ribes per acre in spreading and intensifying blister rust is ascertained from surveys and studies of areas where pine infection is extant. White pine plantations, established in 1931 adjacent to pine infection on areas from which the Ribes had been eradicated, are yielding additional data on the latter point.

Although the major lines of work enumerated above yield data on the effectiveness of the Ribes eradication work in controlling blister rust, the proper interpretation of these data is dependent upon a thorough knowledge of the habits of the rust under the various conditions prevailing within the Inland Empire. To increase our knowledge of these habits supplementary studies are conducted as time permits. The accounts of two such studies are included in this report.

The progress of all work of this project is given under the following titles:

1. The Growth and Regeneration of Ribes in Stream Type Following Ribes Eradication.

by
H. E. Hoy
Associate Forester

INTRODUCTION

It has been proven that the removal of all Ribes from within and near stands of white pine gives absolute protection to such stands from the parasitic fungus, by whose pine blister rust, or from the further introduction of the disease which has become established within the stands prior to the eradication of the Ribes. The most efficient practical Ribes eradication methods, when applied to protect vast acreages of white pine, do not result in the removal of every Ribes bush and new Ribes bushes grow each year, usually following disturbance of sites on which Ribes grew. Therefore, it is obvious that satisfactory protection can not be afforded stands of white pine until at least portions of such stands have been worked several times within a period of several years. However, it is known that present Ribes eradication methods result in the removal of most of the original bushes and therefore give a degree of protection to the adjacent white pines. It is essential that this degree of protection be evaluated over a period of years in order to ascertain the effectiveness of the Ribes eradication work in controlling white pine blister rust.

Although protection to stands of white pine is a result of the eradication of Ribes, the degree of protection must be measured in terms of the infection resulting from quantities of Ribes remaining or developing after the eradication work. Two general lines of study are being followed to provide the required information. They are (1) study of the growth and regeneration of Ribes following Ribes eradication work and (2) study of the effect of known amounts of Ribes per acre in spreading and intensifying blister rust.

The study of the growth and regeneration of Ribes, which has been carried on in stream type only, is conducted on representative sample plots established in 1921, 1930 and 1931 in 14 drainages. The effect of known amounts of Ribes per acre in spreading and intensifying blister rust is determined from surveys and studies of areas where pine infection is extant. White pine plantations, established in 1921 adjacent to pine infection on areas from which the Ribes had been eradicated, are yielding additional data on the latter point.

Although the major lines of work enumerated above yield data on the effectiveness of the Ribes eradication work in controlling blister rust, the proper interpretation of these data is dependent upon a thorough knowledge of the habits of the rust under the various conditions prevailing within the Inland Empire. To increase our knowledge of these habits supplementary studies are conducted as time permits. The accounts of two such studies are included in this report.

The progress of all work of this project is given under the following titles:

1. The growth and regeneration of Ribes in Stream Type following Ribes eradication.

2. The Effect of Known Amounts of Ribes Per Acre in Spreading and Intensifying Blister Rust.

3. Infection Studies at Long Meadow Creek, Idaho.

4. Infection Studies at Newman Lake, Washington.

5. The Infection of Pines in Plantations After Ribes Eradication.

6. Infection Studies at Cheekye, B. C.

7. The Influence of Weather on the Infection of Pines, Newman Lake, Washington.

8. A Study of the Movement of the Mycelium of Cronartium ribicola Fischer During the Incubation Period in Pinus monticola Doug.

COSTS

Scouting for blister rust in 1934 was incidental to the disease study work. Therefore, the following statement of costs for this project includes the small amount expended for scouting work.

DISEASE STUDY COSTS, 1934

Classification of Expenditures	Jan. 1-June 30 Regular Funds	NIRA Funds Jan. 1-Dec. 31			Total-1934
	Idaho-Wash.	Idaho	Montana	Washington	
Salaries, Permanent Men	$1,002.89	$3,961.57		$ 1,657.50	$ 6,621.96
Wages, Temporary Men	20.60	1,687.15		25.00	1,732.75
Supplies		83.37		62.33	145.70
Transportation and Travel	32.18	1,199.12	$ 4.65	516.90	1,742.85
Total Expenditures 1934	$1,055.67	$6,931.21	4.65	$ 2,261.73	$10,243.26
1/3 of 1932 and 1933 Equipment*		9.83		9.83	
Net Cost, 1934	$1,055.67	$6,931.04	$ 4.65	$ 2,271.56	$10,262.92

*Correction to cover two years' depreciation of truck Number 14. $319.60 included in 1933 cost figures whereas two-thirds of total cost of $508.89 or $339.26, should have been charged. The difference, in amount of $19.66 is charged in 1934.

Classification of Expenditure	Year 1-June 30 Regular Funds			
	Technician			
Salaries,				
Permanent Men				
Wages,				
Temporary Men				
Supplies				
Transportation and Travel				
Total Expenditures 1934				
1/8 of 1932 and 1933 Equipment*				
Net Cost, 1934				

THE GROWTH AND REGENERATION OF RIBES IN STREAM TYPE FOLLOWING RIBES ERADICATION

By
Leiton E. Nelson
Agent

PURPOSE

The purpose of this study is to determine the effect of stream type Ribes eradication on the Ribes population.

LOCATION OF STUDY AREAS

This study is being made in 14 drainages, 7 of which are on the Clearwater and 7 on the Potlatch Timber Protective Association lands. The drainages on the Clearwater unit are located in the vicinity of Pierce and Headquarters, Idaho, and those on the Potlatch unit are in the vicinity of Bovill and Elk River, Idaho.

DESCRIPTION OF PLOTS

In 1929, 1930 and 1931, 247 permanent plots were established for this study at 20-chain intervals in each of the 14 selected drainages. Each plot, which was surveyed at right angles to the stream type, measures 0.2 of a chain (13.2 feet) wide and is as long as the stream-type width at the point of plot location. For convenience in examination and in the computation of data, each plot is inspected by milacre units which, as used, are 6.6-foot squares.

WORK DONE

After the establishment of 247 plots, 69 were eliminated from further examination because of the absence of Ribes before any Ribes eradication. Therefore, the data on the growth and regeneration of Ribes in stream type following Ribes eradication are secured from the remaining 178 plots which have a combined area of 6.538 acres. Each of these plots has been checked immediately preceding and each year following the initial and each subsequent eradication of Ribes from the area including the plot.

RESULTS

Of the 14 drainages included in this study, few have had identical Ribes eradication treatment. Thus we find the study data yielding information on the Ribes conditions at various intervals before and after each Ribes eradication disturbance as follows:

(1) Before and from one to five years after the initial Ribes eradication.
(2) Before and from one to three years after the second working.
(3) Before and from one to two years after the third working.

From the plot data secured during the annual inspections, the total number of feet of Ribes live stem per acre in each drainage before and after each Ribes eradication disturbance has been computed. The results are given in Table No. 1.

RIVER REJUVENATION

By

Ralton E. Nelson

Agent

PURPOSE

The purpose of this study is to determine the effect of stream dike eradication on the dikes downstream.

LOCATION OF STUDY AREA

This study is being made in 14 drainages, 7 of which are on the Clearwater and 7 on the Potlatch Timber Protective Association Lands. The drainages on the Clearwater unit are located in the vicinity of Pierce and Headquarters, Idaho, and those on the Potlatch unit are in the vicinity of Avery and the River, Idaho.

DESCRIPTION OF PLOTS

In 1929, 1930 and 1931, 247 permanent plots were established for this study at 25-chain intervals in each of the 14 selected drainages. Each plot, which was surveyed at right angles to the stream type, measures 6½ by a chain (13.1 feet) wide and is as long as the stream-type width at the point of plot location, for convenience in examination and in the computation of data, and is inscribed by silcote white paint, and used, are 5.6-foot squares.

MORE DATA

After the establishment of 247 plots, 69 were eliminated from further examination because of the absence of dikes before any dikes eradicating. Therefore, the data on the growth and regeneration of dikes in stream type following dike eradication are secured from the remaining 178 plots which have a combined area of 6.956 acres. Each of these plots has been checked immediately preceding and each year following the initial and each subsequent eradication of dikes from the area including the plot.

METHOD

Of the 14 drainages included in this study, five have had initial eradication treatment. These we find the study data yielding information on the dike conditions at various intervals before and after each dikes eradication treatment as follows:

(1) Before and from one to five years after the initial dike eradication.
(2) Before and from one to three years after the second working.
(3) Before and from one to two years after the third working.

From the plot data secured during the annual inspections, the total number of feet of dikes five ears per acre in each drainage before and after each dike eradication disturbance has been computed. The results are given in Table No. 1.

TABLE NO. 1

TOTAL FEET OF LIVE STEM PER ACRE OF ALL RIBES SPECIES BEFORE AND AFTER RIBES ERADICATION

Potlatch Forest Unit

Area Status	Feet of Ribes Live Stem Per Acre						
	E. Fk. of Potlatch Creek	Mallory Creek	Deep Creek	Johnson Creek	Cameron Creek	Shattuck Creek	Ruby Creek
Imm.* before 1st erad.	113,649	59,524	25,804	39,560	41,266	66,651	12,741
Imm.* after 1st erad.		792	496	1,849	2,441	3,692	
1 yr. after 1st erad.	751	996	810	2,189	3,388	8,405	1,870
2 yrs. after 1st erad.	734	1,245	(1)627				
3 yrs. after 1st erad.	851	902	895				
4 yrs. after 1st erad.	894	1,603	(1)578				
5 yrs. after 1st erad.			801				
1 yr. after 2nd erad.	303	539		963	649	1,142	
2 yrs. after 2nd erad.				1,616	754	1,218	
1 yr. after 3rd erad.				585	425	520	

Clearwater Forest Unit

Area Status	Feet of Ribes Live Stem Per Acre						
	Deer Creek	N.Fk.of S.Fk.of Reed's Creek	S. Fk. of Reed's Creek	N. Fk. of Reed's Creek	Alder Creek	Loop Creek	Orofino Creek
Imm.* before 1st erad.	49,638	66,098	43,798	38,290	20,040	43,375	12,064
Imm.* after 1st erad.	202	185	139		1,418	858	
1 yr. after 1st erad.	600	812	350	1,281	2,118	1,492	175
2 yrs. after 1st erad.	(2) 318	1,777	993	2,333	3,287	2,348	594
1 yr. after 2nd erad.	134	96	127	(3) 564	(3) 991		382
2 yrs. after 2nd erad.	340	241	424	(3) 860			
3 yrs. after 2nd erad.	582	287					
Imm.* after 3rd erad.						581	
1 yr. after 3rd erad.			176	531	343	767	
2 yrs. after 3rd erad.					375	1,000	

* Immediately
(1) Reduction caused by grazing and logging.
(2) Reduction caused by logging railroad construction.
(3) Partial third eradication before the plots were checked.

It is notable in Table No. 1 that each working of an area results in a reduction of the Ribes live stem per acre which is followed by an annual increase of the remaining amounts due to new growth on old stem and from seedlings. To indicate the average reduction that is attained by each Ribes eradication, the data have been compiled to show the average amount of live stem per acre before and after each working and the percent of live stem reduction in each case. This information is given in Table No. 2.

Potlatch Forest Unit

Feet of Ribes Live Stem Per Acre

Area Station	No. Yr. of Pollution Creek	Mallory Creek	Deep Creek	Solomon Creek	Cameron Creek	Shattuck Creek	Sandy Creek
Imm.* before 1st cred.	113,648	59,524	25,804	39,560	41,256	26,621	12,741
Imm.* after 1st cred.		798	496	1,849	2,441	3,692	
1 yr. after 1st cred.	761	396	610	1,144	2,388	4,400	1,920
2 yrs. after 1st cred.	764	1,745	(1)627				
3 yrs. after 1st cred.	851	902	895				
4 yrs. after 1st cred.	944	1,609	(1)978				
5 yrs. after 1st cred.			801				
1 yr. after 2nd cred.	708	580		982	548	1,147	
2 yrs. after 2nd cred.				1,618	764	1,918	
1 yr. after 3rd cred.				565	459	530	

Clearwater Forest Unit

Area Station	Feet of Ribes Live Stem Per Acre					
	Deer Creek	S.Fk. of Need's Creek	S. Fk. of Need's Creek	N. Fk. of Need's Creek	Alder Creek	Loop Creek	Oro-fino Creek
Imm.* before 1st cred.	49,532	66,389	45,758	38,390	70,040	45,376	12,064
Imm.* after 1st cred.	202	185	178		1,410	856	
1 yr. after 1st cred.	630	612	380	1,021	3,118	1,462	178
2 yrs. after 1st cred.	(2) 312	1,777	922	2,335	3,387	2,346	594
1 yr. after 2nd cred.	124	96	127	(3) 664	(3) 951		382
2 yrs. after 2nd cred.	740	311	454	(3) 860			
3 yrs. after 2nd cred.	630		457				
Imm.* after 3rd cred.						851	
1 yr. after 3rd cred.			178	851	343	727	
2 yrs. after 3rd cred.					375	1,030	

* Immediately

(1) Reduction caused by grazing and logging.
(2) Reduction caused by logging railroad construction.
(3) Partial third eradication before the plots were established.

TABLE NO. 2

FEET OF RIBES LIVE STEM PER ACRE IMMEDIATELY BEFORE AND AFTER THE FIRST, SECOND AND THIRD RIBES ERADICATION AND THE PERCENT OF LIVE STEM REMOVED

Forest Unit	Feet of Ribes Live Stem Per Acre						Percent of Live Stem Removed		
	First Eradication		Second Eradication		Third Eradication				
	Before	After	Before	After	Before	After	1st Erad.	2nd Erad.	3rd Erad.
Potlatch T.P.A.	41,123	2,421	2,900	688	1,057	482	94.1	76.3	54.4
Clearwater T.P.A.	35,551	962	1,595	439	656	365	97.3	72.4	44.4
Both Units	38,338	1,675	2,101	537	905	438	95.6	74.4	51.6

Table No. 2 shows that in the 14 drainages under study initial Ribes eradication work on areas supporting an average of 38,338 feet of Ribes live stem per acre resulted in the destruction of 95.6 percent of the live stem. The second working of the areas, when they had 2,101 feet of live stem per acre, accomplished only a 74.4 percent reduction, and the third working to reduce 905 feet per acre resulted in only a 51.6 percent eradication. Further evidence that the percent of available Ribes live stem removed during the second and third workings decreases as the amount of such available live stem becomes less is found in the averages for each forest unit. These show reductions during the second and third workings of varying amounts of Ribes live stem as follows: 2,900 feet, 76.3 percent; 1,595 feet, 72.4 percent; 1,057 feet, 54.4 percent; and 656 feet, 44.4 percent. It is immediately suspected that the major factor which is responsible for the much lower percentage reduction of Ribes live stem during the second and third workings is the small size of the remaining Ribes bushes. To clarify this point a segregation according to size classes of the Ribes bushes recorded in 1934 on 11 drainages was made. This summary, which excludes the seedlings, is given in Table No. 3.

TABLE NO. 3

DISTRIBUTION OF RIBES BUSHES BY SIZE CLASSES

Forest Unit	No. Drainages	Total No. Bushes	F.L.S. per Acre	Percentage of Total Ribes Bushes in Each Bush Size Class						
				* 0.1-5	6-10	11-20	21-30	31-40	41+	Total
Potlatch T.P.A.	6	265	825	53.6	21.9	15.5	4.9	1.1	3.0	100.0
Clearwater T.P.A.	5	151	371	68.2	20.5	7.3	2.6	0.7	0.7	100.0
Both Units	11	416	627	58.9	21.4	12.5	4.1	1.0	2.1	100.0

*Feet of Ribes live stem.

It will be noted in Table No. 3 that approximately 59 percent of all Ribes bushes have not to exceed five feet of live stem each, and about 80 percent have not over ten feet each. Since Ribes bushes with ten feet of live stem or less each are very often screened by other brush and herbaceous growth in the

TABLE NO. 3

DISTRIBUTION OF TIMBER STANDS BY SIZE CLASSES

Forest Unit	No. Strata	Total Area	Total V.I.B. per Acre	Percentage of Total Board Volume in Each Basal Size Class					
				0.1-5	5-10	11-20	21-30	31-40	41+
Portland T.F.A.	5	345	534	71.9	15.5	4.3	1.1	1.0	1.0
Gleanwater T.F.A.	5	151	371	69.3	20.5	7.3	2.6	0.7	0.0
South Units	11	410	[illegible]	69.9	17.4	7.5	3.4	1.	1.1

*Feet of Ribbs Live stem.

stream type, many of these will be missed by the eradicators. Thus, it is apparent that after the removal of the larger bushes, the further reduction of the remaining live stem becomes more difficult. Undoubtedly this accounts for the decreases in the percents of live stem removed during the second and third workings.

After each Ribes eradication the remaining Ribes bushes put on new growth, root crowns left in the ground send up new stems and seedlings develop from the seed stored in the ground. All of these account for an annual Ribes live stem increment. From the study data the average annual increase in Ribes live stem per acre has been computed. These computations include the yearly growth of Ribes in 13 drainages during three to five years which gives a total of 37 cases as a basis. In no case was there any known disturbance of the area between inspections. Table No. 4 shows the computed increment for each forest unit.

TABLE NO. 4

PERCENT ANNUAL INCREASE IN TOTAL RIBES LIVE STEM AFTER RIBES ERADICATION

Forest Unit	Percent Annual Increase		
	Minimum	Maximum	Average
Potlatch T.P.A.	-27.6	127.7	45.9
Clearwater T.P.A.	9.3	343.1	83.7
Both Units	-27.6	343.1	60.7

It will be noted in Table No. 4 that a decrease in Ribes live stem is recorded for the Potlatch unit. This condition was recorded for two adjacent drainages, one in 1931 and the other in 1932, with no apparent reason in evidence. Therefore, for statistical treatment the data from these areas are regarded as normal and are averaged with the 35 instances of increases.

The important point in Table No. 4 is that although the annual increment of Ribes live stem remaining after Ribes eradication work varies from minus 27.6 percent to plus 343.1 percent of such remaining amounts, the average yearly increase on the two forest units was about 61 percent. It will be noted that the growth rate on the Clearwater unit is much higher than on the Potlatch unit. Undoubtedly this is the result of more favorable moisture and soil conditions that prevail on the former unit.

So far the discussion has dealt principally with the total number of feet of Ribes live stem. An important part of this live stem comes from seedlings developing after Ribes eradication. Table No. 5 shows the number and feet of Ribes live stem per acre of seedlings in each forest unit, and Table No. 6 presents the percent of total live stem per acre from seedlings.

Forest Unit	Percent Annual Increase Virginia Pine	Yellow Poplar
Both Units	-27.5	344.1
Quarry Tract	8.1	340.1
Poplar Tract	-57.5	127.7

TABLE NO. 5

NUMBER AND FEET OF LIVE STEM PER ACRE OF ALL RIBES SEEDLINGS AFTER RIBES ERADICATION

Area Status	Potlatch Unit		Clearwater Unit		Both Units	
	Number	F.L.S.	Number	F.L.S.	Number	F.L.S.
1 yr. after 1st erad.	827	77.5	493	51.6	656	64.3
2 yrs. after 1st erad.	715	57.5	753	220.2	744	180.0
3 yrs. after 1st erad.	442	205.1			442	205.1
4 yrs. after 1st erad.	510	259.2			510	259.2
1 yr. after 2nd erad.	258	43.0	29	14.2	119	35.5
2 yrs. after 2nd erad.	92	41.1	91	60.4	92	50.4
3 yrs. after 2nd erad.			130	100.9	130	100.9
1 yr. after 3rd erad.	20	12.5	54	23.2	40	19.0
2 yrs. after 3rd erad.			58	33.5	58	33.5

TABLE NO. 6

PERCENT OF TOTAL RIBES LIVE STEM ATTRIBUTABLE TO RIBES SEEDLINGS

Area Status	Percent Total Live Stem From Seedlings		
	Potlatch Unit	Clearwater Unit	Both Units
1 yr. after 1st erad.	5.2	5.4	3.8
2 yrs. after 1st erad.	6.4	12.1	11.3
3 yrs. after 1st erad.	33.3		23.3
4 yrs. after 1st erad.	24.8		24.8
1 yr. after 2nd erad.	6.2	3.0	4.6
2 yrs. after 2nd erad.	3.9	17.6	7.1
3 yrs. after 2nd erad.		20.9	20.9
1 yr. after 3rd erad.	2.6	5.1	4.1
2 yrs. after 3rd erad.		6.8	6.8

Table No. 5 shows that the largest numbers of seedlings appear during the first two years after the initial Ribes eradication work, but that some seedlings start as late as the fourth year. It is also evident from the data taken on the Clearwater unit that the second and third workings are also followed by new seedlings although only relatively few.

Ribes live stem from seedlings, which is quite insignificant during the first year, increases steadily each year thereafter until another eradication disturbance causes a reduction. The firmly established seedlings remaining after such disturbance and the additional new seedlings likewise account for an increase in live stem after the second and third workings. The small size of even the largest of these seedlings and the fact that they are screened by other brush makes their eradication a difficult problem.

TABLE NO. 5

Area Shown	Potlatch Unit		Clearwater Unit		Both Units	
	Number	T.P.A.	Number	T.P.A.	Number	T.P.A.
1 Yr. after 1st cut.	807	77.6	492	81.6	676	61.7
2 Yrs. after 1st cut.	718	87.5	782	230.7	714	136.0
3 Yrs. after 1st cut.	442	256.1			442	304.1
4 Yrs. after 1st cut.	310	258.2			310	258.2
1 Yr. after 2nd cut.	558	49.0	29	14.2	170	35.6
2 Yrs. after 2nd cut.	92	9.1	91	80.4	92	17.4
3 Yrs. after 2nd cut.			130	102.9	130	102.9
1 Yr. after 3rd cut.	20	14.8	54	22.2	40	13.0
2 Yrs. after 3rd cut.			25	32.4	25	32.4

TABLE NO. 6

Area Shown	Potlatch Unit	Clearwater Unit	Both Units
1 Yr. after 1st cut.	7.2	5.4	5.9
2 Yrs. after 1st cut.	5.4	15.1	11.5
3 Yrs. after 1st cut.	23.3		23.3
4 Yrs. after 1st cut.	24.8		24.8
1 Yr. after 2nd cut.	6.2	3.0	4.6
2 Yrs. after 2nd cut.	3.9	17.6	7.1
3 Yrs. after 2nd cut.		20.9	20.9
1 Yr. after 3rd cut.	2.6	6.1	4.1
2 Yrs. after 3rd cut.		8.8	8.8

Table No. 6 shows that the percent of total live stem attributable to seedlings increases each year after a disturbance. The fact that there was a large increase in Ribes live stem between the second and third years after the initial work, while there was a decrease in number of seedlings, is evidence that many of the seedlings become permanently established within one to two years after germination.

It is notable that four years after the initial disturbance approximately 25 percent of the live stem on the area is in seedlings, and that three years after the second working the seedling live stem is about 21 percent of the total. These data indicate the importance of the Ribes seedlings in the restocking of stream type areas with sufficient quantities of live stem to provide a serious menace to the adjacent white pines. It is evident that each Ribes eradication subsequent to the initial work should be done in the years when most of the Ribes seedlings are large enough to be seen quite readily but before they have attained sufficient size to have created a serious rust-spreading hazard.

Another important factor in determining the time of a second or a third Ribes eradication is the age at which stream type Ribes seedlings produce seed. To date neither flowers nor fruits have been found on Ribes seedlings on the plots. These observations include seedlings that were from one to five years old although the majority were not over four years old.

SUMMARY

(1) Of the 247 plots originally established in 14 drainages on the Potlatch and Clearwater Timber Protective Association lands, 178 are studied annually to determine the amount of Ribes growth and regeneration developing after Ribes eradication.

(2) Initial Ribes eradication reduced an average of 38,338 feet of Ribes live stem per acre to 1,675 feet per acre, which is a 95.6 percent reduction.

(3) The second working reduced 2,101 feet of Ribes live stem per acre to 537 feet per acre, or a 74.4 percent reduction.

(4) The third working reduced 905 feet of Ribes live stem per acre to 438 feet per acre, or a 51.6 percent reduction.

(5) Approximately 80 percent of the Ribes bushes remaining on the areas after one to three workings have not over ten feet of live stem each.

(6) The average annual Ribes live stem increment is 60.7 percent.

(7) The average annual Ribes live stem increment on the Clearwater forest unit exceeds that on the Potlatch unit by 36.8 percent probably because of more favorable soil and moisture conditions on the former unit.

(8) The largest numbers of seedlings appear on the area in the first and second years after the initial Ribes eradication.

(9) The mortality of seedlings is high during the fall and winter following germination.

Table No. 6 shows that the percent of total live stem attributable to seedlings increases each year after a disturbance. The fact that there was a large increase in live stem between the second and third years after the initial work, while there was a decrease in number of seedlings, is evidence that many of the seedlings become permanently established within one to two years after germination.

It is notable that four years after the initial disturbance approximately 25 percent of the live stem on the area is seedlings, and that three years after the second working the seedling live stem is about 21 percent of the total. These data indicate the importance of the Tibbs seedling in the restocking of stream type areas with sufficient quantities of live stem to provide a material resource to the adjacent white pines. It is evident that each Tibbe eradication subsequent to the initial work should be done in the years when most of the Tibbe seedlings are large enough to be seen quite readily but before they have attained sufficient size to have created a serious rust-spreading hazard.

Another important factor in determining the time of a second or a third Tibbe eradication is the age at which stream type Tibbe seedlings produce seed. To date neither flowers nor fruits have been found on Tibbe seedlings on the plots. These observations include seedlings that were from one to five years old although the majority were not over four years old.

SUMMARY

(1) Of the 547 plots originally established in 14 drainages in the Potlatch and Clearwater Timber Protective Association tracts, 378 are adequately to determine the amount of tibbe growth and regeneration obtained after Tibbe eradication.

(2) Initial Tibbe eradication reduced an average of 30,976 feet of Tibbe live stem per acre to 1,975 feet per acre, which is a 93.6 percent reduction.

(3) The second working reduced 1,101 feet of Tibbe live stem per acre to 527 feet per acre, or a 74.4 percent reduction.

(4) The third working reduced 302 feet of Tibbe live stem per acre to 208 feet per acre, or a 51.6 percent reduction.

(5) Approximately 60 percent of the Tibbe brushes remaining on the areas after one to three workings have not over ten feet of live stem each.

(6) The average annual Tibbe live stem increment is 50.7 percent.

(7) The average annual stem increment on the Clearwater-Potlatch unit exceeds that on the Pend Oreille unit by 80.3 percent probably because of more favorable soil and moisture conditions on the former unit.

(8) The largest numbers of seedlings are on the area in the first and second years after the initial Tibbe eradication.

(9) The mortality of seedlings is high during the fall and winter following germination.

(10) A few seedlings develop during the third and fourth years following the initial Ribes eradication, and during each year following the succeeding Ribes eradications that are covered by this study.

(11) Four years after the initial Ribes eradication, the Ribes seedling live stem constituted about 25 percent of the total live stem on the area.

(12) Neither flowers nor fruits have been found on Ribes seedlings on the plots. This includes observations of plants from one to five years old.

THE EFFECT OF KNOWN AMOUNTS OF RIBES PER ACRE IN SPREADING AND INTENSIFYING BLISTER RUST

By
E. L. Joy
Associate Forester

PURPOSE

It is the purpose of this study to determine the effect of Ribes eradication on the spreading and intensifying of the rust.

METHODS

Two types of studies are used to obtain a measure of the amounts of pine infection caused by infection on various amounts of Ribes. The first is a survey of areas of pine infection that have been eradicated of Ribes to determine the amount of pine infection formed before and the amount formed after Ribes eradication and the survey of other unworked areas of pine infection for comparison. The second is the use of plantations of white pine nursery stock which was disease free when planted to ascertain the amount of pine infection developing after Ribes eradication. Each of these plantations is located adjacent to pine infection that invaded prior to the initial Ribes eradication and is, therefore, subjected to most severe infection conditions. For both types of study, the amounts of Ribes live stem on and adjacent to the areas under consideration have been ascertained.

RESULTS FROM STUDIES IN PINE INFECTION CENTERS

Five pine infection centers that were caused by Ribes before their removal in 1929 to 1931 were surveyed in 1934 to ascertain the amount of pine infection that was formed before and the amount that was formed after Ribes eradication. Data from four additional infection areas, from which the Ribes were not eradicated prior to 1933, were secured for comparison. A summary of the data secured from these areas is given in Table No. 1.

[illegible]

By

R. L. Loy

Associate Forester

[illegible]

It is the purpose of this study to determine the effect of blister rust infection on the spreading and thickening of the crown.

METHODS

Two types of studies are used to obtain a measure of the amounts of pine infection caused by infection on various amounts of Ribes. The first is a survey of areas of pine infection that have been eradicated of Ribes to determine the amount of pine infection formed before and the amount formed after Ribes eradication and the survey of other unworked areas of pine infection for comparison. The second is the use of plantations of white pine nursery stock which was disease free when planted to ascertain the amount of pine infection developing after Ribes eradication. Each of these plantations is located adjacent to pine infection that invaded prior to the initial Ribes eradication and is, therefore, subjected to most severe infection conditions. For both types of study, the amounts of Ribes alive area on and adjacent to the areas under consideration have been ascertained.

[illegible]

Five nine infection centers that were caused by Ribes before their removal in 1925 to 1931 were surveyed in 1934 to ascertain the amount of pine infection that was formed before and the amount that was formed after Ribes eradication. Data from four additional infection areas, from which the Ribes were not eradicated prior to 1934, were secured for comparison. A summary of the data secured from these areas is given in Table No. 1.

TABLE NO. 1

COMPARISON OF BLISTER RUST INTENSIFICATION ON WORKED AND UNWORKED AREAS

A. Areas From Which the Ribes Were Not Eradicated Prior to 1933

Infection Area	Year Control Established	Number of Pines			Percent of Pines		
		Examined	Infected Prior to 1930	Infected 1930-1932	Infected Prior to 1930	Infected 1930-1932	Total Infected
Mazie Creek		150	5	36	3.3	24.0	27.3
Weaver Creek		100	4	37	4.0	37.0	41.0
Snake Creek		800	10	204	1.2	25.6	26.8
Crystal Creek		85	13	41	15.3	48.2	63.5
Totals and Averages		1,135	32	318	2.8	28.0	30.8

B. Areas From Which the Ribes Were Eradicated 1929 - 1931

Infection Area	Year Control Established	Number of Pines			Percent of Pines		
		Examined	Infected Prior to Control	Infected After Control	Infected Prior to Control	Infected After Control	Total Infected
S. Fk. Reed's Creek	1931	428	73	16	17.1	3.7	20.8
N. Fk. Reed's Creek	1931	380	40	0	10.6	0.0	10.6
Deep Creek Plot	1929	5,375	419	20	7.8	0.4	8.2
Long Meadow Creek	1931	636	337	16	53.0	2.5	55.5
Deer Creek	1931	850	85	10	10.0	1.2	11.2
Totals and Averages		7,669	954	62	12.4	0.8	13.2

It is shown in part A of Table No. 1 that on the areas from which the Ribes were not removed prior to 1933, and therefore on which the spread and intensification of blister rust progressed undisturbed through 1932, the infected pines constituted an average of 2.8 percent of the stands prior to 1930. During the ensuing three-year period, 1930-1932, the disease spread to an additional 28 percent of the trees. Thus it is evident that with a nucleus of infection consisting of cankers on only about three percent of the pines associated with the average amount of original Ribes, three years of blister rust intensification will bring the number of infected trees to total almost one-third of the stand around such a nucleus.

In part B of the table, which shows the data from five areas from which the Ribes have been eradicated, it is notable that although 12.4 percent of all trees were infected prior to Ribes eradication, the Ribes remaining and developing after the eradication work caused the infection of an average of only 0.8 percent more pines. The 28 percent increase of infected pines on unworked areas is to be contrasted with the 0.8 percent increase of infected pines on areas eradicated of Ribes. This comparison is conservative in view of the fact that 12.4 percent of the pines on the control areas were infected prior to Ribes eradication whereas only 2.8 percent of the trees on the check areas were infected prior to 1930. Of further

Infection Area	Year Control Metab- lizing Began	Number of Pines Examined Prior to 1930	Infected Prior to 1930	Infected Between 1930-1932	Infected Between 1930-1932	Total Infected 1930-1932	Percent of Pines Infected Prior to 1930	Infected Between 1930-1932	Total Infected 1930-1932
Basin Creek	1930	5	39	6.3	24.6	27.8			
Upper Creek	1931	6	37	4.6	27.0	41.0			
Summa Creek	1930	10	259	1.9	25.9	26.8			
Clipped Creek	29	11	41	26.3	46.2	70.9			
Totals and Averages	1,130	63	19	4.6	28.0	32.6			

4. Areas From Which the Aldes Were Eradicated 1930 - 1932

Infection Area	Year Control Metab- lizing Began	Number of Pines Examined Prior to 1930	Infected Prior to 1930	Infected Between 1930-1932	Infected Between 1930-1932	Total Infected 1930-1932	Percent of Pines Infected Prior to 1930	Infected Between 1930-1932	Total Infected 1930-1932
S. Fk. Reed's Creek	1931	856	74	16	13.1	7.7	30.7		
N. Fk. Reed's Creek	1933	360	0	10.5	0.0	10.5			
Deep Creek Plot	1930	5,179	412	20	7.8	0.4	5.2		
Long Meadow Trees	1934	696	207	16	29.7	0.5	30.2		
Deer Creek	1931	840	16	12	1.9	1.2	3.1		
Totals and Averages	7,930	864	42	13.4	0.4	13.8			

It is shown in part A of Table No. 1 that on ten areas from which the Aldes were removed prior to 1930, and therefore on which the spread and intensification of blister rust progressed undisturbed through 1932, the infected Aldes constituted an average of 5.8 percent of the stands prior to 1930. During the ensuing three-year period, 1930-1932, the disease spread to an additional 26 percent of the trees. Thus it is evident that with a nucleus of infection consisting of only about three percent of the pines associated with the average amount of original Aldes, three years of blister rust intensification will bring the number of infected trees to total almost one-third of the stand around each nucleus.

In part B of the table, which shows the data from five areas from which the Aldes have been eradicated, it is notable that although 13.4 percent of all trees were infected prior to Aldes eradication, the Aldes remaining and developing after the eradication work caused the infection of an average of only 0.8 percent more pines. The 26 percent increase of infected pines on adjacent areas is to be contrasted with the 0.3 percent increase of infected pines on areas eradicated of Aldes. This constitutes in conservative fix view of the fact that 13.4 percent of the pines on the control areas were infected prior to Aldes eradication, whereas only 5.8 percent of the trees on the other areas were infected prior to 1930. Of further

importance is the fact that the five areas on which control work was performed are yet to receive the follow-up Ribes eradication before they will be classed as having fully met control requirements.

In order to follow the annual progress of blister rust before and after Ribes eradication, studies were started in 1929 on the Long Meadow Creek area which was cited in Table No. 1 as an area from which the Ribes have been eradicated. The results from these studies, which indicate the effectiveness of control work on this area, are presented in the succeeding report titled "Infection Studies at Long Meadow Creek, Idaho".

INFECTION STUDIES AT LONG MEADOW CREEK, IDAHO

By
Leiton E. Nelson
Agent

INTRODUCTION

With the discovery of white pine blister rust on the pines near the junction of Long Meadow and Three Bear Creeks in 1929, measures were taken to study the rate of spread of the disease on this area. Since the eradication of Ribes from the area was in progress at the time the disease was found, and since the disease had already been intensified through the fruiting of the original cankers formed in 1923, the study was planned to yield information on the effect of Ribes eradication on disease intensification in and around an area supporting heavily infected pines. The fact that only Ribes viscosissimum and R. lacustre occur on the Long Meadow area indicates the importance of this study of the effectiveness of control.

PURPOSE

The purpose of this study is to determine the effectiveness of Ribes eradication in controlling the spread of white pine blister rust on the Long Meadow Creek infection area.

WORK DONE

Ribes Eradication

The initial control efforts on the Long Meadow infection area were made in 1929 when approximately 300 acres were eradicated of Ribes. In 1931 this area was reworked and an additional 536 acres adjacent thereto were worked for the first time. Whereas the initial work on the 300-acre unit, which was done near the end of the season, did not result in the desired reduction of Ribes live stem, the work of 1931 was very satisfactory.

Pine and Ribes Infection Studies.

After the discovery of the disease in 1929 studies were instituted and carried on as shown in the following outline:

1929 (1) Scouting to determine the limits of pine infection.
(2) Determining the quantity of Ribes, amount of Ribes infection, and the quantity and age of pine infection on 4.1 acres.

1930 Determining by a 4 percent cruise (strips 13.2 feet wide at 5-chain intervals) the quantity, distribution and age of pine infection, and quantity of Ribes on the entire area supporting infection.

1931 The same as in 1930 but by the use of every other strip established in 1930 which gives a 2 percent cruise.

1932 The sample strips used in 1931 were used again in 1932. However, instead of studying all the trees on these strips, examination was made of only

Carlton T. Nelson
Agent

INTRODUCTION

[illegible] the discovery of white pine blister rust on Elm Pass near the junction of Long Meadow and Three Mens Creeks in 1929, measures were taken to study the role of cycads at the disease on this area. Since the eradication of Ribes from the area was in progress at the time the disease was found, and since the disease had already been increasing through the rusting of the original centers formed in 1922, the study was planned to yield information on the effect of Ribes eradication on disease intensification in and around an area supporting heavily infected pines. The fact that only Ribes vulgare and R. lacustre occur on the Long Meadow area indicates the importance of this study of the effectiveness of control.

PURPOSE

The purpose of this study is to determine the effectiveness of Ribes eradication in controlling the spread of white pine blister rust on the Long Meadow Creek infection area.

WORK DONE

Ribes Eradication

The initial control efforts on the Long Meadow infection area were made in 1929 when approximately 300 acres were eradicated of Ribes. In 1931 this area was reworked and an additional 536 acres adjacent thereto were worked for the first time. Whereas the initial work on the 300-acre unit, which was done near the end of the season, did not result in the desired reduction of Ribes live stem, the work of 1931 was very satisfactory.

Pine and Ribes Infection Studies

After the discovery of the disease in 1929 studies were initiated and carried on as shown in the following outline:

1929 (1) Scouting to determine the limits of pine infection.
(2) Determining the quantity of Ribes, amount of Ribes infection, and the quantity and age of pine infection on 4.1 acres.

1930 Determining by a 4 percent strips (strips 16.5 feet wide at 5-chain intervals) the quantity, distribution and size of pine infection, and quantity of Ribes on the entire area supporting infection.

1931 The same as in 1930 but by the use of every other strip established in 1930 which gives a 2 percent cruise.

1932 The sample strips used in 1931 were used again in 1932. However, instead of striping all the trees on these strips, examination was made of only

enough pines to give the required sample of conditions. These trees were numbered and tagged to insure the examination of identical trees in each successive year. In addition, 26 trees with incipient cankers were selected at random for a study of the distribution pattern of cankers of the same age. The amount of Ribes live stem on the area was determined from the data on the Ribes bushes found on the survey strips.

1933 No data taken.

1934 The survey made in 1934 was similar to that of 1932. Each tagged tree was examined and basic and canker data recorded. Trees with incipient cankers were selected at random throughout the infected area and tallies of these cankers recorded. The amount of Ribes live stem on the area was determined from data taken on one-chain wide strips at 10-chain intervals which gives a 10 percent cruise.

RESULTS

Ribes Data

Ribes data secured in 1934 are found incorporated in Table No. 1. This table gives the amounts of Ribes live stem per acre on the area each year since 1929 except 1933 when no survey was made.

TABLE NO. 1

AMOUNTS OF RIBES LIVE STEM PER ACRE ON THE LONG MEADOW INFECTION AREA 1929-1932, 1934

Eradication Status	Year Checked	Acres Sampled	Percent Sample	Ribes L.L.S. per acre		
				P.lac.	R.vis.	Total
Before 1929 erad. (2)	1929	4.1	100	1,881	27	1,908
Before 1929 erad. (1)	1929	300.0	2	803	278	1,081
After 1929 erad. (3)	1929	300.0	2	145	85	230
After 1929 erad. (2)	1930	69.0	4	309	32	341
After 1931 reerad.(3)	1931	822.2	2	9	3	12
After 1931 reerad.(2)	1931	103.0	2	10	2	12
After 1931 reerad.(2)	1932	96.0	2	18	37	55
After 1931 reerad.(2)	1934	97.0	10	26	7	33

(1) Obtained by totaling the estimated number of feet of Ribes live stem pulled by the eradicators and the number of feet of remaining Ribes live stem which was determined by checking after Ribes eradication.

(2) Obtained as part of the disease survey information.

(3) Results of checking after Ribes eradication.

	Year Checked	Larvae Examined	Trees Sample	Tipes s.j.s. per acre		
Treatment Given				S.Jose	R.Vis.	Total
Before 1925 treat. (1)	1925	400.0	2	805	276	1,081
After 1925 treat. (2)	1926	200.0	2	1.40	85	230
After 1926 treat. (3)	1930	63.0	4	306	86	392
After 1927 treat.(4)	1931	(Old)	2		0	12
After 1927 treat.(5)	1931	100.0	2	10	2	12
After 1928 treat.(6)	1932	31.0	2	76	20	96
After 1928 treat.(7)	1932	57.0	2	56	7	63

(1) Obtained by totaling the estimated number of feet of Tipes five years prior to the previous one (the number of feet of pruning given Live stem wood was determined by checking after Tipes eradication.

(2) Obtained as part of the disease survey information.

(3) Results of checking after Tipes eradication.

Table No. 1 shows that the initial Ribes eradication on 300 acres reduced the quantity of Ribes to 230 feet of live stem per acre and the second working, on 836 acres, resulted in the removal of all but 12 feet per acre. Since there was no occurrence of Ribes along the streams that differed greatly from the general distribution in the uplands, these average figures are indicative of conditions on the entire area.

Following each Ribes eradication disturbance on the Long Meadow Creek area, the changes in the amounts of live stem per acre have been ascertained during each survey. It has been found that the 230 feet of Ribes live stem per acre remaining after the 1929 work had grown to 341 feet per acre in 1930. Although no survey was made immediately preceding the 1931 Ribes eradication work, it is probable that the area then supported 500 feet of live stem per acre. Whatever the amount may have been, it was found to have been reduced to an average of 12 feet of live stem per acre during the second working.

By 1932 one year's growth on 12 feet of live stem per acre and the growth from remaining root crowns brought the total amount per acre to 55 feet. In 1934, two years later, a decrease of 22 feet per acre was recorded instead of an anticipated increase. In all probability this decrease was caused by the death of Ribes bushes from the drought during the summers of 1933 and 1934, and from the flood conditions in the stream bottoms during the winter of 1933-34.

Pine Infection Data.

The surveys conducted in five of the past six years on the Long Meadow Creek area have provided information on the trend of rust intensification. Table No. 2 is a summary of the data showing the number and percent of trees found infected, the number and percent found dead and the total number of recorded cankers in each survey.

TABLE NO. 2

SUMMARY OF PINE INFECTION DATA FOR TREES STUDIED DURING EACH SURVEY, LONG MEADOW CREEK, 1929-1932, 1934

Year of Examination	No. Chains strip	Percent Cruise	No. Trees Exam.	No. Trees Inf.	Percent Trees Inf.	Trees Killed By Blister Rust		Number Cankers		
						No.	Percent	On Living Trees	On Dead Trees	Per Inf. Tree
1929					*5.0					
1930	138	4	1,862	338	18.1	0	0	4,800	0	14.2
1931	51	2	1,000	277	27.7	0	0	2,731	0	9.9
**1932	96	2	636	337	53.0	0	0	3,336	0	9.9
1934	97	2	636	353	55.5	27	4.2	2,513	1,097	10.2

* Estimated from random study and observations.
** 1932 data corrected to include trees infected prior to 1931 but not found infected until 1934.

Year of Inventory	No. Uhaina trees	Per-cent Uhaina trees	No. Pitch Pine trees	No. Pitch Pine Inf.	Per-cent Pitch Pine Inf.	No. Trees Killed by Pitch Pine Beetle	Number Beetles Ob.	Number Beetles Est.	Per-cent Inf. Trees
1928					4.0				
1930	139	4	1,852	378	15.1	0	6,800	0	19.2
1931	91	2	1,000	271	21.7	0	2,124	0	9.3
**1932	56	2	656	337	53.0	0	1,728	0	5.3
1934	37	2	656	380	56.5	24	3,514	1,567	10.3

Estimated from random study and observations.

** 1932 data corrected to include trees infected prior to 1931 but not found infected until 1934.

Since most of the infections originating in one year do not appear as visible cankers until two years later, a two-year lag must be recognized in the interpretation of the survey results. That is, most of the cankers formed in 1928, the last year before the initial eradication, were not recorded until 1930 and most of those formed in 1930, the year before the second working, were not found until 1932. Therefore, by comparing the percents of pines found infected in 1930 and 1932, most of the effect of the initial Ribes eradication is indicated while a comparison of the percents found infected in 1932 and 1934 gives a measure of the influence of the second working for a comparable two-year period.

Referring to Table No. 2 it is seen that there was a 34.9 percent increase in infected trees between 1930 and 1932. Undoubtedly all of this increase was not caused by 230 to 341 feet of Ribes live stem per acre found after the initial Ribes eradication, but some can be charged against an additional 850 feet that was not removed until the late summer of 1929. However, there was enough infection started in 1929 and 1930 to show that 230 to 341 feet of Ribes live stem per acre on an infection area is sufficient to cause abundant rust intensification.

During a comparable period of two years after the second working, as found by comparing the 1932 and 1934 results, there was only an additional 2.5 percent of the trees infected. Probably only a small part of this increase can be attributed to an estimated 500 feet of Ribes live stem per acre before its reduction to 12 feet in 1931 since Ribes eradication work that year was performed during the early summer. Contrasting this 2.5 percent increase from 12 to 55 feet of Ribes live stem per acre with the 34.9 percent increase from 230 to 341 feet of live stem per acre it is evident that the control work on this infection area has been very effective.

Another important point brought out in Table No. 2 is that approximately four percent of the infected trees bearing over 30 percent of the cankers were killed by blister rust prior to the 1934 survey. Since additional trees with a large number of cankers each will probably die within the next few years, it is apparent that it will not be long until the trees with only a few cankers each will be the predominant factor in rust intensification on this area.

From the canker data secured each year it has been possible to compute the approximate number of cankers formed in each year of rust intensification since establishment of the disease on this area in 1923. Since the Ribes data procured during each survey of the area give the amounts of Ribes live stem per acre that were on the area in each of these years, the responsibility for new cankers can be determined. Table No. 3 has been prepared to show the approximate number of cankers formed in each year that the rust has intensified, for every original canker (1923 origin) on the area, and the amount of Ribes live stem per acre that was responsible in each case.

Since most of the infections originating in one year do not appear as visible cankers until two years later, a two-year lag must be assigned in the interpretation of the survey results. That is, part of the canker flush in 1957, the last year before the initial application, were not present until 1959 and were of worse larvae in 1960, the year before the second watering, were not found until 1962. Therefore, by comparing the patterns of these cankers in 1960 and 1962, most of the effect of the initial sites sanitation is indicated while a comparison of the percents killed between 1962 and 1964 gives a measure of the influence of the second watering for a comparable two-year period.

Referring to Table 2a, it is seen that there was a 46.6 percent increase in infected trees between 1960 and 1962. Considering all of the factors that could be 200 to 401 feet (2 Ribes live stem) after the initial Ribes eradication, but none can be charged specifically to additional soil moisture as the trees were not reached until the late summer of 1962. However, there was enough interest shifted in 1962 to raise the 200 to 401 feet of Ribes live stem per acre to 588 feet of live stem per acre with the 46.6 percent increase from 200 to 401 feet of Ribes live stem per acre. Another measure of the influence of the watering can be obtained by comparing the 1962 and 1964 surveys. Since the trees were not reached until late summer of 1962, the 1964 survey was the first one after the watering. Comparing the 1962 and 1964 surveys, it is seen that the percent increase in infected trees was 46.6 percent, while the increase in Ribes live stem per acre was 46.6 percent. Considering only the Ribes live stem per acre, the increase was 46.6 percent. Considering only the Ribes live stem per acre, the increase was 46.6 percent. Considering only the Ribes live stem per acre, the increase

TABLE NO. 3

APPROXIMATE NUMBER OF CANKERS FORMED IN EACH YEAR OF RUST INTENSIFICATION FOR EVERY ORIGINAL CANKER ON THE AREA AND THE AMOUNTS OF ASSOCIATED RIBES

Probable Years of Origin	Number of Cankers	Ribes F.L.S. per Acre
1923	1	1,908
1926 and 1927	2,135	1,908
1928	343	1,908
1929	40	230 (1)
1930	41	341
1931	132	12 (1)
1932	20	55

(1) Ribes data secured after Ribes eradication. Probably part of the cankers were formed before eradication.

It is notable in Table No. 3 that with the reduction of Ribes live stem by the initial Ribes eradication in 1929 there was a marked reduction in the number of cankers formed but that the further reduction of Ribes in 1931 was accompanied by an increase in the number of new cankers. It is also evident that variations in the amounts of live stem each year since 1928 have not been accompanied by proportional variations in canker production. Undoubtedly these irregularities are attributable to differences in weather conditions each year. However, it is clearly shown by the relatively small number of cankers originating in each year since 1929 that the reduction of Ribes has been very effective in reducing disease intensification on an area where a large volume of aeciospores are produced annually.

SUMMARY

1. White pine blister rust introduced in 1923 was found on pines of the Long Meadow Creek area in 1929.

2. Initial Ribes eradication work, which reduced the Ribes live stem to 230 feet per acre, was in progress on this area at the time the disease was discovered.

3. The reworking, which reduced the Ribes population of the area to 12 feet of live stem per acre, was done in 1931.

4. In 1932 it was found that the amount of Ribes live stem had been increased by new growth to a total of 55 feet per acre.

5. It is believed that drought during the summers of 1933 and 1934 and flood waters during the winter of 1933-34 were responsible for the reduction of Ribes live stem to 33 feet per acre in 1934.

SUMMARY

1. White pine blister rust infection in 1934 was found on pines of the Long Meadow Creek area in 1937.

2. Ribes plants were destroyed in 1934 and 1935 and 1936 and 1937 and 1938 and 1939 and 1940 and 1941 and 1942 and 1943 and 1944 and 1945 and 1946 and 1947 and 1948 and 1949 and 1950 and 1951 and 1952 and 1953 and

6. During the two-year period following the initial Ribes eradication work there was a 34.9 percent increase in infected pines.

7. During the two-year period following the rework, only a 2.5 percent increase in infected pines occurred.

8. The death from blister rust prior to 1934 of four percent of the infected trees bearing about 30 percent of the cankers indicates the important part in future rust intensification on this area that the newly infected trees will take.

9. For every introductory canker of 1923 origin on the Long Meadow Creek area, about 2,478 cankers were formed during the first three years of rust intensification, which preceded the first eradicative efforts. Only about 233 additional cankers were formed during the four years following this work.

INFECTION STUDIES AT NEWMAN LAKE, WASHINGTON, 1934

By
E. L. Joy
Associate Forester

INTRODUCTION

The first pine infection center found in the Inland Empire was discovered near Newman Lake, Washington in the spring of 1928. Canker studies showed that the disease invaded this area about 1923.

Since Ribes inerme and R. lacustre were the only species of Ribes on the area, measures were taken to study the disease-spreading ability of R. lacustre alone, after the removal of R. inerme.

The necessary surveying and mapping of the plot area was started in the fall of 1928. In the spring of 1929 this work was completed and the initial and second eradication of R. inerme from the plot and a belt one-half mile wide around the plot were performed. During the summer of 1929 the white pine trees and R. lacustre bushes on the plot were tagged, their locations plotted on the plot map, basic data recorded for each and all examined for infection. Each canker found was marked with a numbered tag. Infection data were recorded for each canker and for each infected R. lacustre bush.

Reworking of the area to remove R. inerme sprouts and seedlings and reexamination of the plotted pines and Ribes to secure infection data have been done each year since 1929. To supplement this study seven small plantations of Pinus monticola, P. strobus and P. flexilis transplants were established on the plot in 1931. In June of the same year, a cooperative weather station was established on the plot in order to more accurately measure the metecrological factors related to the spread and intensification of the disease. This station has been reestablished and operated each year since 1931.

RESULTS

A. Eradication of R. inerme.

Although the largest part of the R. inerme live stem was removed from the plot and the surrounding area in 1929, small amounts have been eradicated in each succeeding year. Seedlings and sprouts from pieces of layered stem, the latter having been buried under heavy deposits of cottonwood leaves in a swamp, have constituted the bulk of the live stem eradicated in each year since 1930. Table No. 1 shows the amount of R. inerme live stem eradicated in each year from 1929 to 1934.

INFECTION STUDIES AT NEMAH LAKE, WASHINGTON, 1934

By

E. L. Loy

Scientific Observer

Introduction

The first root infection center found by the Indian Service was surveyed near Dewey Lake, Washington in the spring of 1928. Shortly after that the disease invaded this area about 1928.

Since Pinus ponderosa and P. jeffreyi were the only species of pines in the area, measures were taken to study the disease-spreading ability of P. jeffreyi alone, after the removal of P. ponderosa.

The necessary surveying and mapping of the plot were started in the fall of 1928. In the spring of 1929 this work was completed and the initial and second re-setting of P. jeffreyi from the old one-half inch wire-nail pegs were the plot were performed. During the summer of 1929 the entire plot was examined for Inocutis dealbata or the fruit body, their location plotted on the basic data recorded for each and all examined for infection. Each conifer found was marked with a numbered tag. Infection data were recorded for each conifer and for each infected P. jeffreyi brush.

Reworking of the area to remove P. jeffreyi carcasses and seedlings and reexamination of the plotted pines and Ribes to secure infection data have been done each year since 1929. To supplement this study seven small plantations of pines consisting, P. strobus and P. jeffreyi transplants were established on the plot in 1931. In June of the same year, a comparative method was established on the plot in order to more accurately measure the meteorological factors related to the spread and intensification of the disease. This station has been reestablished and operated each year since 1931.

Discussion

A. Eradication of P. jeffreyi.

Although the largest part of the P. jeffreyi live stem was removed from the plot and the surrounding area in 1929, small amounts have been eradicated in each succeeding year. Seedlings and sprouts from pieces of injured slash, the latter having been buried under heavy deposits of cottonwood leaves in a swamp, have contributed the bulk of the live stems eradicated in each year since 1931. Table 1c, 1 shows the amount of P. jeffreyi live stem eradicated in each year from 1929 to 1934.

TABLE NO. 1

AMOUNTS OF R. INERME ERADICATED FROM THE NEWMAN LAKE PLOT, 1929-1934

Year	Acres Worked	No. Times Area Worked		Total Feet of Live Stem Eradicated	Feet of Live Stem per Acre
		Eradication Crew	*Plot Crew		
1929	45.0	2	1	126,884	2,820
1930	45.0	1	1	1,012	22
1931	45.0	1	1	516	11
1932	47.6	1	1	373	8
1933	50.0	1	1	395	8
1934	50.0	1	1	133	3
6-year Totals	50.0	7	6	129,313	2,872

*Not a systematic coverage for R. inerme. These crews, during the course of their regular work, pulled all R. inerme found.

It is shown in Table No. 1 that the initial eradication and second working in the spring of 1929 removed an average of 2,860 feet of R. inerme live stem per acre from a total of 45 acres.

The largest part of this live stem grew in a swampy portion of the plot covering 16.5 acres. From this unit an average of 4,360 feet of R. inerme live stem per acre was removed. It is significant that 91 percent of the infected pines and 90 percent of the cankers that resulted from Ribes infection prior to the removal of R. inerme in 1929 are found on this portion of the plot.

B. R.lacustre data

The removal of R. inerme in 1929 left only R. lacustre to continue the spread of the rust. Although not as abundant as R. inerme, there is sufficient R. lacustre in the 12 bushes with 520 feet of live stem per acre to cause an appreciable number of new cankers each year if only quantity of Ribes is necessary. The distribution of R. lacustre is quite uniform as is shown by the fact that on the 16.5 acres where R. inerme was so abundant, there are 12 bushes with 504 feet of live stem of R. lacustre per acre, which is approximately the average for the entire plot.

C. R.lacustre infection data

One inspection of all of the R. lacustre bushes on the plot was made during the period from June to September, 1934 at which time a quantitative

TABLE NO. 1

AMOUNTS OF R. INERMIS REMOVED FROM THE MERRIAM LAKE PLOT, 1929-1934

Year	Acres Worked	Area Worked Treadication Crew	*Plot Crew	Live Stem of Trees Removed	Live Stem per Acre
1929	10.0	4	4	154,884	15,488
1930	15.9	1	1	1,012	63
1931	8.4	2	1	114	14
1932	7.6	1	1	342	45
1933	5.0	2	1	284	57
1934	4.0	1	1	47	12
6-year Totals	50.0	7	6	156,813	3,136

the courses of their regular work, pulled all R. inermis found.

It is shown in Table No. 1 that the initial eradication and thereafter in the spring of 1930 removed an average of 3,847 trees of R. inermis per acre from a total of 45 acres.

The largest part of this live stem grew in a swampy portion of the plot covering 15.5 acres. From this area the average of 4,850 trees of R. inermis per acre was removed. It is significant that it pastured at the intervals of three and 30 percent of the number that grazed this strip following the removal of R. inermis in 1929 was found on this portion of the plot.

2. R.laevigata data

The removal of R. inermis in 1929 left only R. laevigata on the entire plot. Although not as abundant as R. inermis, there is sufficient R. laevigata in the 15 brushes with 500 trees of live stem per acre to create an appreciable number of new sprouts each year. It is only evident by differences in the distribution of R. laevigata in quite uniform as to number for the first two years. In the 15.5 acres where R. inermis was so abundant, there are 12 brushes with 504 feet of live stem of R. laevigata per acre, which is approximately one stump for the entire plot.

3. R.laevigata infection data

One inspection of all of the R. laevigata brushes on the plot was made during the period from June to September, 1934 at which time a qualitative

estimate of the amount of infection on each infected bush was recorded. This included the examination of a different group of bushes in each month until data on all bushes had been recorded. Assuming that each group of bushes examined was indicative of the conditions on the entire plot, a comparison has been made of the average percentages of bushes infected on comparable inspection dates during the past four years. This comparison is made in Table No. 2.

TABLE NO. 2

PERCENTAGES OF R. LACUSTRE BUSHES CLASSIFIED BY SHADE FORM THAT WERE INFECTED ON COMPARABLE INSPECTION DATES, 1931-1934

Year of Examination	Percentages of Bushes Infected											
	No Shade			Half Shade			Full Shade			All Forms		
	June	July-Aug.	Aug.-Sept.	June	July-Aug.	Aug.-Sept.	June	July-Aug.	Aug.-Sept.	June	July-Aug.	Aug.-Sept.
1931	14.3	20.4	20.4	24.5	32.4	36.1	16.4	24.2	27.4	20.7	28.4	31.6
1932	13.9		25.7	22.4		41.7	16.6		34.8	19.2		37.6
1933	0.0	26.2	28.6	0.7	26.1	28.4	2.2	29.7	31.3	1.4	28.0	30.0
*1934	70.0	33.3	75.0	72.0	65.5	59.7	57.1	69.4	46.0	64.7	65.5	52.9

*All bushes on the plot were not examined each month.

It is shown in Table No. 2 that there was a heavy early infection of Ribes in 1934 resulting in more bushes infected in June than in the same month of any preceding year shown. This is the reverse of conditions in 1933 when very little Ribes infection was visible until the July-August inspection. However, unlike the trend of infection in 1933, only a few additional bushes were infected after June. This dearth of newly infected bushes after June was undoubtedly the result of hot and dry weather. In spite of these unfavorable conditions there were more bushes infected throughout the 1934 season than there were in any previous season given.

Since all bushes on the plot were not examined at regular intervals, a complete measure of the total amount of infection on the plot during any one month was not obtained. Therefore the data from 18 selected bushes that were examined at 10-day intervals are used as a basis for computation of the amount of infection on the entire plot. It has been determined in previous years that this method gives satisfactory results.

For each of the 18 selected bushes, data were recorded on the amounts of leaf surface bearing uredinia pustules, telia columns and necrotic tissue. These data were then converted to show the equivalent number of leaves totally covered with each. Since the detailed information from all 14 inspections made during the season are not essential to show the trend of rust development, only the results from the first and last inspections of the season and the principal intervening inspections are presented in Table No. 3.

estimate of the amount of infection on each infected bush was recorded. This included the examination of a different group of bushes in each month until data on all bushes had been recorded. Regarding the percentage of bushes originally infected as an indicative of the conditions on the entire plot, a comparison has been made of the average percentages of bushes infected on comparable inspection dates during the past four years. This comparison is made in Table No. 2.

TABLE NO. 2

PERCENTAGE OF A LARGE NUMBER OF BUSHES INFECTED AT EARLY AND LATER INSPECTIONS IN CONSECUTIVE YEARS, 1931-1934

Time of Inspection	% Bushes				Percentage of Bushes Infected							
	June	July-Aug.	Aug.-Sept.		Early Shade			Full Shade		All Forms		
					June	Sept.		June	July-Aug.		July-Aug.	Sept.
1931	14.2	20.4	20.4	24.3	32.3	36.1	16.4	24.3	27.4	20.7	28.4	31.6
1932	11.5		30.7	32.4		41.7	11.0		26.8	16.		7.8
1933	0.0	29.2	26.6	0.7	16.1	29.4						30.0
*1934	70.0	92.1	79.3									

*All bushes on the plot were not examined each month.

It is shown in Table No. 2 that there was a heavy early infection of bushes in 1931 resulting in more bushes infected by the same month of any preceding year shown. This is the reverse of conditions in 1932 when very little blight infection was visible until late July-August inspection. However, after the break of rainy season in 1933, only a few additional bushes were infected after June. This depart of nearly infected bushes after June was undoubtedly the result of not any weather. In spite of these unfavorable conditions 6 new bushes infected throughout the 1933 season than were in any previous season given.

Since all bushes on the plot were not examined at regular intervals, a complete measure of the total amount of infection on the plot during any one month was not obtained. Therefore the data from 11 selected bushes that were examined at 10-day intervals was used as a basis for computation of the amount of infection on the entire plot. It has been determined in previous years that this method gives satisfactory results.

For each of the 11 selected bushes, data were recorded on the number of leaf surface bearing uredinia pustules, total column and percentage thereof. These data were then converted to show the equivalent number of leaves totally covered with each. Since the detailed information from all 11 inspections each season are not essential to show the trend of rust development, only the results from the first and last inspections of the season for the spraying, interesting inspections are presented in Table No. 3.

TABLE NO. 3

DETAILED STUDY OF INFECTION ON 18 SELECTED BUSHES
NEWMAN LAKE, WASHINGTON, 1934

Shade Class	Inspection Date	Total No. Infected Leaves	Percent Inf. per Inf. leaf	Equivalent Number Leaves 100 Percent Infected			
				Uredinia	Telia	Necrotic	Total
No Shade (6 bushes)	June 5	291	7.5	12.0	0.2	9.7	21.9
	June 25	282	11.1	6.8	15.0	9.4	31.2
	July 25	1,232	7.5	13.6	56.4	22.4	92.4
	Aug. 24	567	7.0	4.0	10.2	25.7	39.9
	Sept. 23	184	7.0	0.4	0.6	11.8	12.8
	Oct. 15	23	6.6	0.1	0.1	1.4	1.6
Half Shade (7 bushes)	June 5	263	8.7	14.7	3.1	5.2	23.0
	June 25	643	5.0	8.3	11.5	12.2	32.0
	July 25	896	5.1	9.4	16.9	19.0	45.3
	Aug. 24	302	6.5	1.9	5.8	11.9	19.6
	Sept. 23	114	7.1	0.6	1.5	6.0	8.1
	Oct. 15	30	10.5	0.1	0.1	2.9	3.1
Full Shade (5 bushes)	June 5	47	4.3	1.5	0.3	0.2	2.0
	June 25	110	4.6	1.6	2.5	1.0	5.1
	July 25	190	6.8	2.3	6.0	4.7	13.0
	Aug. 24	178	11.9	3.9	8.1	9.2	21.2
	Sept. 23	74	13.1	0.4	2.6	6.7	9.7
	Oct. 15	2	3.0	0.0	0.0	0.1	0.1
All Bushes	June 5	601	7.8	28.2	3.7	15.0	46.9
	June 25	1,545	5.7	40.1	27.1	20.9	88.1
	July 25	2,318	6.5	24.3	79.3	47.2	150.8
	Aug. 24	1,047	7.7	9.8	24.2	46.7	80.7
	Sept. 23	372	8.2	1.5	4.7	24.5	30.7
	Oct. 15	55	8.6	0.2	0.1	4.4	4.7

It is shown in Table No. 3 that the open and half shade bushes bore abundant infection in June but that the infection on full shade bushes showed very little intensification until July. The peak of telia production was reached during July on bushes in the open and half shade but was one month later on bushes in full shade. However, the total telia production on all bushes was highest in July.

The total number of infected bushes on the plot was determined during the season. Applying the results of the intensive study of the rust development on the selected bushes to the total number of infected bushes on the plot, the total telia-producing leaf surface or pine-infection potential on the plot was computed. These results with comparable data secured in previous years are given in Table No. 4.

DETAILED STUDY OF INFECTION OF 12 SELECTED BROODS
MEDIAN LAKE, MONTCALM CO., 1948

Broods Class	Inspection Date	Total No. Infected Larvae	Percent Infected Larvae	Equivalent Number Larvae 100 Percent Infected			
				Spring	Fall	Spring	Fall
(5 broods)	June 5	251	7.5	1.0	0.7		1.4
	June 15	292	11.1	5.5	12.0	6.4	
	July 25	1,660	7.5	1.6	24.4		26.0
	Aug. 24	527	7.9	4.0	10.3	25.7	28.4
	Sept. 22	194	7.0	0.4	1.5	3.6	1.8
	Oct. 16	25	6.7	0.2		1	1.6
Well Spaced (7 broods)	June 5	105	4.1	14.7	5.1		
	June 25	65	0.4	0.7	1.4	4.4	
	July 20	256	6.1	2.4	12.1	17.1	10.7
	Aug. 24	38	2.1	1.0	2.4	14.4	4.0
	Sept. 22	114	7.1	0.5	1.5	3.3	2.1
	Oct. 15	8	14.6	0.1	0.4	1.7	1.7
Pair Shade (5 broods)	June 5	57	4.2	3.0	0.5	1.8	2.4
	June 20	310	4.4	1.8	0.6	1.8	6.1
	July 25	252	6.3	2.2	6.3	4.7	12.0
	Aug. 24	178	11.3	2.3	9.1	9.8	20.1
	Sept. 22	74	12.1	1.4	2.1	6.7	5.7
	Oct. 15	2	6.4	0.1	0.1	0.1	0.3
All Shades	June 5	913	6.1	25.4	7.1	44.1	84.7
	June 25	1,818	5.7	25.1	37.1	34.4	80.7
	July 25	2,414	6.5	24.2	75.1	41.5	100.1
	Aug. 24	1,047	7.7	7.5	21.7	46.1	60.1
	Sept. 22	475	8.2	2.5	4.1	10.2	8.7
	Oct. 15	35	8.6	0.2	0.1	0.4	0.7

TABLE NO. 4

COMPARISON OF AMOUNTS OF TELIA PRODUCED EACH YEAR FROM 1929 TO 1934, NEWMAN LAKE, WASHINGTON

Period Examined	Computed Number of Leaves 100 Percent Infected with Telia	Percent of Total Infection Which is Telia
June-August 1929	0.02	2.5
June-August 1930	32.35	62.3
June, 1931	28.03	54.5
July, 1931	545.48	62.7
August, 1931	481.04	61.1
June, 1932	3.61	2.6
August, 1932	2,951.15	58.5
June, 1933	0.00	0.0
July-August 1933	1,380.41	57.6
Sept. 1933	1,669.24	38.3
June, 1934	420.05	30.8
July, 1934	1,229.15	52.6
August, 1934	375.10	30.0
Sept.-Oct. 1934	72.85	15.3

It is shown in Table No. 4 that the peaks of telia production occurred in July 1931, August 1932, September 1933 and July 1934. That the time of this maximum production of telia is largely dependent upon early season weather conditions is indicated in the table, the data for 1933 and 1934 showing the most pronounced contrast. In 1932, when cold weather continued into June, no telia were visible in June which delayed the peak of telia production until September. Following an extremely mild winter, the spring of 1934 was very early resulting in abundant telia in June followed by the peak of telia development in July

Undoubtedly the weather conditions that are conducive to telia production are also favorable for pine infection. Therefore, it is evident that the majority of pine infection produced in any one year might occur within any one of three or four months. This would have a decided influence on the time of appearance of the resulting cankers in the bark.

COMPARISON OF AMOUNTS OF TWIG PRODUCED EACH YEAR FROM
PLOTS OF 1934, NEWMAN PARK, TABULATION

Period Counted	100 Percent Infected with Galls	Percent of Twig Infection
Dec.-August 1930	[illegible]	[illegible]
Jan.-August 1930	[illegible]	[illegible]
June, 1931	[illegible]	[illegible]
July, 1931	[illegible]	[illegible]
August, 1931	[illegible]	[illegible]
June, 1932	[illegible]	[illegible]
August, 1932	[illegible]	[illegible]
June, 1933	[illegible]	[illegible]
July-August 1933	[illegible]	[illegible]
June, 1934	[illegible]	[illegible]
June, 1934	[illegible]	[illegible]
July, 1934	[illegible]	[illegible]
August 1934	[illegible]	[illegible]
Sept.-Oct. 1934	[illegible]	[illegible]

It is shown in Table I. that the years of twig production vary in July 1931, August 1932, September 1933 and July 1934. That the time of this maximum production of galls is largely dependent upon early spring weather conditions is indicated in the table, the data for 1932 and 1934 showing the most advanced dates. In 1933, when cold weather continued into June, no galls were visible in June which judged the peak of twig production until September. Judging on current year shoots, the spring of 1935 was very early resulting in abundant galls in June followed by the peak of gall appearance in July.

Undoubtedly the weather conditions that are conducive to galls production are also favorable for pine infection. Therefore, it is evident that the majority of pine infection occurred in any one year about eight and one-half to four months before the peak of gall appearance on the pine of twig production.

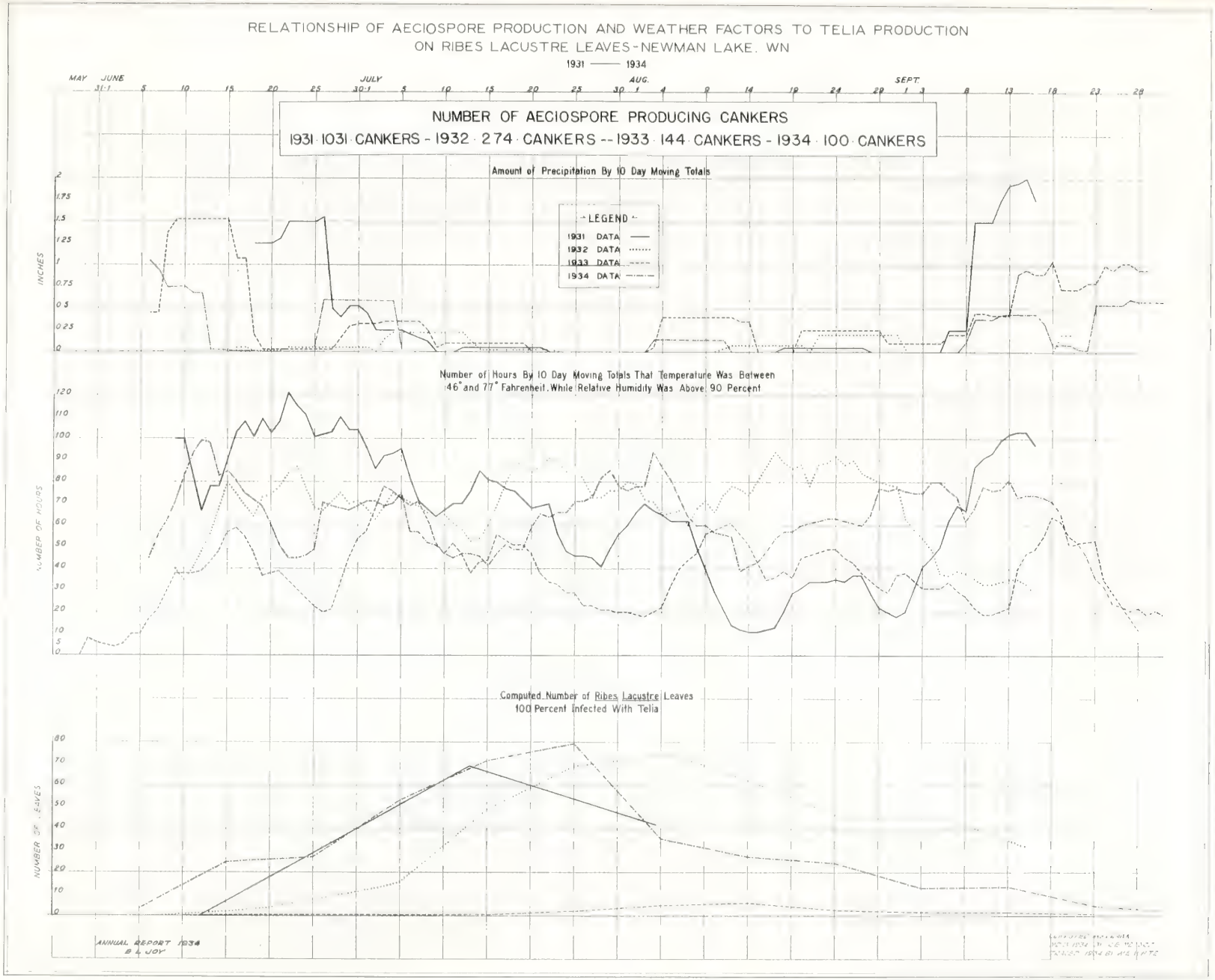
D.-- Weather data

In an attempt to determine the correlation of weather factors with telia production, data were compiled from the daily weather records from the plot for the past four years, and from the infection records for a few selected bushes that were examined at frequent intervals during each of these years. Precipitation, because of its known influence, was computed for each summer season by 10-day moving totals. In like manner, the number of hours of relative humidity above 90 percent during which hours the temperature ranged from 46 to 77 degrees Fahrenheit were computed. These results, with data on the aecia and telia production for these years, are presented in the following graph.



D. Weather data

In an attempt to determine the correlation of weather factors with
for the past four years, and from the infection records for a few selected orchards
that were examined at frequent intervals during each of these years. Precipita-
these years, are presented in the following graph.


RELATIONSHIP OF AECIOSPORE PRODUCTION AND WEATHER FACTORS TO TELIA PRODUCTION
ON RIBES LACUSTRE LEAVES - NEWMAN LAKE, WN
1931 —— 1934
MAY JUNE JULY AUG. SEPT.
NUMBER OF AECIOSPORE PRODUCING CANKERS
1931 1031 CANKERS - 1932 274 CANKERS -- 1933 144 CANKERS - 1934 100 CANKERS
Amount of Precipitation By 10 Day Moving Totals
INCHES
LEGEND
1931 DATA
1932 DATA
1933 DATA
1934 DATA
Number of Hours By 10 Day Moving Totals That Temperature Was Between 46° and 77° Fahrenheit, While Relative Humidity Was Above 90 Percent
NUMBER OF HOURS
Computed Number of Ribes Lacustre Leaves 100 Percent Infected With Telia
NUMBER OF LEAVES
ANNUAL REPORT 1934 B. L. JOY

It is shown in the graph that moisture during the first part of the 1934 season was accompanied by enough warmth to provide many hours of favorable infection weather as represented by the temperature-relative humidity curve. As a result of this condition, telia production increased steadily until the peak was reached on July 25.

Comparison of the curves shows that there was a similarity of weather conditions in the first part of the summers of 1931, 1932 and 1934 and a corresponding similarity of infection conditions in so far as telia production is concerned. Standing out from the others are the curves for 1933. Since cold weather prevailed during the early summer period of 1933, the temperature-relative humidity curve is low and the telia curve extremely low. A continuation of unfavorable weather conditions retarded the development of telia which resulted in only a very small increase in telia during the season.

E. Pine Infection Data.

A comparison of the pine infection data secured in 1934 with comparable data from inspections in previous years is given in Table No. 5. Table No. 6 gives the analysis of all cankers found in 1934.

TABLE NO. 5

PINE INFECTION DATA, NEWMAN LAKE, WASH.
1929 - 1934

Item	1929	1930	1931	1932	1933	1934
Number of acres in plot	25.4	36.2	36.3	47.6	50.0	50.0
*Total Number Pines Studied	752.0	1,334.0	1,338.0	1,576.0	1,580.0	1,580.0
*Total Number Pines Infected	66.0	114.0	134.0	176.0	187.0	202.0
Percent Pines Infected	8.8	8.5	10.0	11.2	11.8	12.8
Number Pines Killed by Blister Rust	0.0	0.0	4.0	7.0	11.0	15.0
**Total Number of Cankers	565.0	1,591.0	1,935.0	2,156.0	2,217.0	2,271.0
Number Cankers per Infected Pine	8.6	14.0	14.4	12.3	11.9	11.2

*Tagged trees, both living and dead.
**21 cankers cut out in 1928 are not included.

It is shown in the graph that moisture during the first part of the 1934 season was accompanied by enough warmth to provide many hours of favorable infection weather as represented by the temperature-relative humidity curve. As a result of this condition, telia production increased steadily until the peak was reached on July 25.

Comparison of the curves shows that there was a similarity of weather conditions in the first part of the summers of 1931, 1932 and 1934 and a corresponding similarity of infection conditions in so far as telia production is concerned. Standing out from the others are the curves for 1933. Since cold weather prevailed during the early summer period of 1933, the temperature-relative humidity curve is low and the telia curve extremely low. A continuation of unfavorable weather conditions retarded the development of telia which resulted in only a very small increase in telia during the season.

E. Pine Infection Data.

A comparison of the pine infection data secured in 1934 with comparable data from inspections in previous years is given in Table No. 6. Table No. 6 gives the analysis of all cankers found in 1934.

TABLE NO. 6

PINE INFECTION DATA, MENOMAN TAMP, WISC.
1929 - 1934

Item	1929	1930	1931	1932	1933	1934
Number of acres in plot	25.4	36.2	36.2	47.5	50.0	50.0
*Total Number Pines Studied	752.0	1,334.0	1,338.0	1,576.0	1,550.0	1,550.0
*Total Number Pines Infected	65.0	114.0	170.0	175.0	167.0	178.0
Percent Pines Infected	8.6	8.5	12.7	11.1	10.8	11.5
Number Pines Killed by Blister Rust	0.0	0.0	4.0	7.0	11.0	18.0
**Total Number of Cankers	565.0	1,591.0	1,186.0	2,152.0	2,218.0	2,771.0
Number Cankers per Infected Pine	8.6	14.0	7.0	12.3	13.3	15.5

*Tagged trees, both living and dead.
**All cankers cut out in 1928 are not included.

TABLE NO. 6

ANALYSIS OF CANKERS, NEWMAN LAKE STUDY PLOT, 1934

Year of Growth Infected	Juv.	First Pyc.	Pyc. Scar	Fruited			Fr. Ret'd	Dead	Miss-ing	?	Not Exam. 1934	Total
				Once	Twice	Sev.						
1931			3					1				4
1930	1	1	2					3				7
1929			3	3				1				7
1928	1	1	13	4	4	1	2	29			1	56
1927			10	1	7	20	52	296	3	3	23	415
1926			11	3	20	25	138	859	3		60	1,119
1925			5		5	2	64	379	4		24	483
1924			3	1		1	11	99	1		3	119
1923			1				5	18			1	25
1922			1			2	5	10			2	20
1921							1	6			2	9
1920								1				1
1919							1	0				1
1918								1				1
?			1	1			1	1				4
Total	2	2	53	13	36	51	280	1,704	11	3	116	2,271

Table No. 5 shows that in 1934 there was an increase of 15 infected trees and 54 cankers. A thorough study of all cankers shows that since the removal of R. inerme there have been 37 trees infected with a total of 67 cankers. Of the 37 infected trees 21 have only cankers resulting from the R. lacustre, while 16 have some cankers chargeable to R. lacustre only and some chargeable to the Ribes prior to the removal of R. inerme.

The 67 cankers caused by R. lacustre alone in the four years after the removal of R. inerme in 1929 are to be contrasted with 2,204 cankers resulting from R. inerme and R. lacustre in the four years prior to 1929. On the surface this indicates that R. lacustre lacks potent infecting powers. However, since the extremely wet year of 1927 and its accompanying spread of abundant infection has not even been approximated since 1929, the full infecting power of R. lacustre has not been measured. Therefore, the above comparison can only be interpreted as an indication that the infecting power of R. lacustre is low when only fair moisture conditions prevail.

Pine Plantation Data.

In May, 1931, 2,340 white pine transplants were planted on the plot in seven units. The total number of pines consisted of 988 each of P. monticola and P. strobus and of 364 P. flexilis. Due to a period of drought immediately following the planting, many of the trees died. By October 1934 only 16.5 percent of the total number planted were surviving. None of these transplants had visible infection in 1934.

Year of Growth Infected	Inf.	First Prc.	Prc. Secs.	Pruned Once	Pruned Twice	Pruned Sev.	Br. Hgtd	Dead	Miss-ing		Not Exam.	Total
1931			5					1				6
1930	1	1	2					3				7
1929			7	3				4				7
1928	1	1	12	4	6	1	7	29			1	62
1927			12	1	5	20	51	285	3	8	29	414
1926			11	6	25	36	136	256	3		80	3,312
1925			5		6	2	24	273	4		24	342
1924			5	1		1	21	99	1		5	114
1923			1				6	23			1	31
1922			1			3	5	10			2	21
1921							1	5			2	8
1920								1				1
1919							1	3				4
1918								1				1
1		1		1			1	1				4
Total	2	2	65	15	35	63	260	1,476	12		3	2,113

Table No. 5 shows that in 1934 there was an increase of 15 infected trees and 64 cankers. A thorough study of all cankers shows that since the removal of *Z. inerme* there have been 87 trees infected with a total of 87 cankers. Of the 87 infected trees 81 have only cankers resulting from *B. laeviate*, while 10 have some cankers due to *E. lecudte* only and some chargeable to the latter color to the removal of *B. inerme*.

The 87 cankers caused by *B. laeviate* alone in the four years after the removal of *B. inerme* in 1930 are to be compared with 3,304 cankers resulting from *B. inerme* and *B. laeviate* in the four years prior to 1930. On the surface this indicates that *E. lecudte* lacks potent infecting power. However, since the extremely wet year of 1927 and the accompanying spread of secondary infection has not been approximated since 1930, the F.I.I infecting power of *B. lecudte* has not been measured. Therefore, the more conservative one only is interpreted as to indicate that the infecting power of *Z. inerme* is low when only fair moisture conditions prevail.

Time Plantation Date.

In May, 1923, 2,760 white pine transplants were planted to the plot in seven units. The total number of pines completed of 396 each of *E. monticola* and *E. arbonea* and of 364 *P. flexilis*. Due to a period of drought immediately following the planting, many of the trees died. By 1930-31 1924 only 15.5 percent of the total number planted were surviving. Some of these transplants had stable infection in 1934.

SUMMARY

1. In 1934, six years after the initial eradication of R. inerme, reworking of the Newman Lake plot resulted in the removal of 3 feet of R. inerme live stem per acre.

2. The largest part of the total R. inerme live stem on the plot was eradicated from a portion of the plot containing 16.5 acres. It has been determined that 91 percent of the infected pines bearing 90 percent of the cankers on the plot are on this 16.5 acre unit.

3. The R. lacustre on the entire plot occurs at the rate of 12 bushes with 520 feet of live stem per acre. The even distribution of this species is indicated by the fact that the 16.5 acre portion from which the bulk of the R. inerme was removed supports 12 bushes with 504 feet of live stem per acre.

4. Approximately 65 percent of all R. lacustre bushes were infected in June, 1934 due to mild weather favoring Ribes infection during the three preceding months.

5. Very few additional bushes became infected after June.

6. Due to the early infection of Ribes, the peak of telia production was reached about July 25.

7. The peaks of telia production in each of the past four years occurred in July, 1931, August, 1932, September, 1933 and July, 1934.

8. There is a distinct correlation between the time of favorable early season weather conditions and the time of maximum telia production.

9. In 1934, 15 additional infected trees and 54 more cankers were found.

10. A thorough study of all cankers shows that 37 trees have been infected with 67 cankers since the removal of R. inerme in 1929. The 67 cankers caused by infected R. lacustre in the four years from 1929 to 1932 are to be contrasted with 2,204 cankers resulting from infected R. inerme and R. lacustre in 1923 and 1926 to 1928.

11. The small amount of infection resulting from R. lacustre should not be construed as an indication that this species lacks potent infecting powers. Data on the full infecting ability of this species will not be forthcoming until we have a measure of the amount of pine infection originating in a very favorable year comparable to 1927.

12. Only 16.5 percent of the 2,340 disease-free white pine transplants planted on the plot in 1931 were alive in 1934. No infection was found on these trees.

SUMMARY

1. In 1934, six years after the initial eradication of *I. taeniae*, reworking of the Tarawa Lake plot resulted in the removal of 3 feet of *I. taeniae* live stem per acre.

2. The largest part of the total *I. taeniae* live stem on the plot was eradicated from a portion of the plot containing 16.5 acres. It was demonstrated that 91 percent of the infected plants bearing 90 percent of the density on the plot are on this 16.5 acre unit.

3. The *I. taeniae* on the entire plot occurs at the rate of 17 trees with 5cm) feet or live stem per acre. The exact distribution of this species is indicated by the fact that the 16.5 acre portion from which the bulk of the *I. taeniae* was removed supports 11 trees with 8cm feet of live stem per acre.

4. Approximately 65 percent of all *I. taeniae* trees were infected in June, 1934 due to wild weather favoring fungus infection during the three preceding months.

5. Very few additional trees became infected after June.

6. Due to the early infection of trees, the peak of termite production was reached about July 25.

7. The peaks of termite production in each of the past four years occurred in July, 1931, August 1932, September, 1933 and July, 1934.

8. There is a distinct correlation between the time of favorable early season weather conditions and the time of maximum termite production.

9. In 1933, 15 additional infected trees and 84 more centers were found.

10. A thorough study of all centers shows that 37 trees have been infected with 87 centers since the removal of *I. taeniae* in 1933. The 87 centers caused by infected *I. taeniae* in the four years from 1930 to 1933 are in contrasted with 2,249 centers resulting from infected *I. taeniae* and *I. taeniae* in 1923 and 1926 to 1928.

11. The small amount of infection resulting from *I. taeniae* should not be construed as an indication that this species incite potent infecting powers. Data on the full infecting ability of this species will not be forthcoming until we have a measure of the amount of pure infection originating in a very favorable year comparable to 1927.

12. Only 16.5 percent of the 2,249 disease-free white pine terminals planted on the plot in 1931 were alive in 1934. No infection was found on these trees.

THE INFECTION OF PINES IN PLANTATIONS AFTER RIBES ERADICATION

By
Leiton E. Nelson
Agent

INTRODUCTION

As a supplementary method of testing the effectiveness of Ribes eradication in protecting white pines from blister rust, six plantations of disease-free pines were established in May, 1931. Each plantation is on or adjacent to an area where both the invasion of pine infection and the initial eradication of Ribes preceded the establishment of such plantations.

DESCRIPTION OF PLANTATIONS

The six plantations are on lands of the Potlatch and Clearwater Timber Protective Associations. Five of these were planted with equal numbers of Pinus monticola and P. strobus and the sixth with P. monticola only. In each the pines were set in rows three feet apart with three-foot spaces between the transplants in each row.

SURVIVAL OF PINES

Due to a period of dry, hot weather, which started shortly after the planting was completed, a heavy mortality of the transplants occurred in 1931. The survival in 1933 of only 12.6 percent of the total number planted indicates the severity of the weather following planting.

During the fall and winter of 1933, an additional toll was taken by road construction on one area and flood waters on another. Therefore, the total number of living pines in 1934 was even less than in 1933. In spite of these heavy losses, there remain sufficient living pines to constitute a fair basis for an indication of the effectiveness of control work. Table No. 1 shows the pine survival and Ribes data for each plantation.

By
Leston E. Nelson
Agent

INTRODUCTION

As a supplementary method of testing the effectiveness of white pine protection with pine tree tubes, six plantations of Chamaecyparis pines were established in May, 1941. Each plantation is on an exposure on or near both the lowside of pine interplanting and the initial eradication of slash preceded the establishment of each plantation.

DESCRIPTION OF PLANTATIONS

The six plantations are on lands of the Potlatch and Clearwater Timber Protective Associations. Five of these were planted with equal numbers of pine seedlings and C. nootkatensis one six stock with C. lawsoniana only. In each the pines were set in rows three feet apart with three-four spaces between the stock in each row.

PLANTING STOCK

[illegible] to a depth of dry, hot weather, which started shortly after the planting was completed, a heavy mortality of the transplants occurred in 1941. The survival in 1942 of only 11.5 percent of the total number planted indicates the severity of the weather following planting.

During the fall and winter of 1942, an additional soil was given by hand cultivation to one area one year before. Therefore, the total number of living pines in 1943 was even less than in 1942. On spite of these heavy losses, there remain sufficient living pines to constitute a fair basis for an indication of the effectiveness of control work. Table No. 1 shows the pine survival and Ribes data for each plantation.

TABLE NO. 1

PINE AND RIBES DATA FROM PINE PLANTATIONS ESTABLISHED IN 1931

Forest Unit	Plantation Locations	P. monticola			P. strobus			Both			Total Feet Ribes Live Stem (3)		
		No. Planted	Survival No.	Survival Percent	No. Planted	Survival No.	Survival Percent	No. Planted	Survival No.	Survival Percent	1931 (4)	1933	1934
Potlatch Timber Protective Association	Cameron Cr.	770	23	3.0	770	13	1.7	1,540	36	2.3	29,957	0.0	0.0
	Elk Cr. (1)	836	31	3.7	836	38	4.5	1,672	69	4.1	2,435	5.0	5.5
	Johnson Cr. (2)	532	25	4.7	532	37	7.0	1,064	62	5.8	1,161	0.0	63.5
	All Areas	2,138	79	3.7	2,138	88	4.1	4,276	167	3.9	33,553	5.0	69.0
Clearwater Timber Protective Association	Quartz Cr.	1,322	64	4.8	1,311	18	1.4	2,633	82	3.1	1,450	0.0	2.0
	Orofino Cr.	284	126	44.4	284	68	23.9	578	194	33.6	1,835	47.5	15.0
	North Fork Reed's Creek	778	129	16.6	0			778	129	16.6	227	35.5	33.5
	All Areas	2,384	319	13.4	1,595	86	5.4	3,989	405	10.1	3,512	82.0	51.5
Both Units	All Areas	4,522	398	8.8	3,733	174	4.7	8,265	572	6.9	37,065	88.0	120.5

(1) Large part of plot destroyed by flood.
(2) Part of plot destroyed by Road Construction.
(3) Total feet of Ribes live stem on and within one chain of plantation.
(4) Before control was established.

TABLE 10

CITY OF [illegible] BOND ELECTION, SEPTEMBER 19, 1950

| Precinct | Registered Voters | Ballots Cast | Percentage Voting | Bonds | | |

In Table No. 1 it is seen that the average survival of P. monticola on the six plantations was 8.8 percent, the average survival of P. strobus on five plantations was 4.7 percent and the average survival of both species on all plantations was 8.9 percent. Thus, we have 398 P. monticola and 174 P. strobus with which to study the spread of the rust from adjacent Ribes remaining after Ribes eradication. It is shown that the total amounts of live stem in the Ribes bushes found on the areas in 1934 range from 0 to 68.5 feet.

PINE INFECTION

Examination in 1934 of the 572 living pines revealed that only three had cankers. These consist of one P. monticola on the Elk Creek plantation and one P. monticola and one P. strobus on the Orofino Creek unit. Each of the P. monticola was infected with a single canker while the P. strobus had two cankers. All cankers originated in 1932 or 1933 which is one to two years after control was established.

Table No. 1 shows that the Ribes live stem found in 1933 totaled only 5 feet on the Elk Creek plantation and 47.5 feet on the Orofino Creek unit. Since the Ribes on each plantation are near a source of abundant aeciospores and are therefore very likely to become infected each year, it is logical to expect pine infection to appear on the trees around the remaining Ribes bushes. Each of the three infected trees found in 1934 is immediately adjacent to a Ribes bush but other pines near these and other Ribes bushes are still uninfected. In this fact there is evidence that the small amounts of Ribes live stem remaining on the plantation areas after Ribes eradication were not sufficient to present a serious rust-spreading factor in 1931, 1932 and 1933. It is possible that weather conditions in these years were not as favorable for abundant rust intensification as they will be in other years. Therefore, a fair measure of the infecting power of the few Ribes bushes on the plantations must include the amounts of pine infection developing in years subsequent to 1933. These data will be obtained from annual inspections of the plantation pines.

INFECTION STUDIES AT CHEEKYE, B. C., 1934

By
R. E. Myers
Agent

INTRODUCTION

With the discovery of blister rust in the West in 1921 and the location of additional infection centers in Washington and British Columbia in 1922, it became apparent that information was necessary on the habits of the disease on native hosts under western conditions. Consequently, studies of the spread of the rust from Ribes to pines were started in 1923 near Cheekye, B. C. where abundant pine infection existed. Destruction by fire in 1925 of the pine plantation on the plot established for these studies necessitated the reestablishment of the plantation in 1926.

PURPOSE

The Cheekye plot was established for the purpose of ascertaining the maximum distance the rust will spread from native Ribes to western white pines under field conditions in the West. Other studies that are being conducted at the same time are providing information on (1) the survival of planted white pine seedlings, (2) the rate of killing of young white pines by blister rust, and (3) the comparative susceptibility of several species of white pine.

WORK DONE IN 1934

In May 1934, two years after the last previous inspection, all of the study pines were examined. Growth, foliage and infection data were recorded for each living tree and infection data for each dead tree. Each canker found was classified according to the year of growth infected and the stage of canker development.

RESULTS

A. Pine Growth

Following reestablishment of the plot in 1926, the examination of all planted pines on the area has been made each year except 1931 and 1933. The height of each tree has been recorded at every inspection and the number of feet of needle bearing stem of each tree has been taken each year since 1930. From these data on 675 representative trees, the average height and average amount of needle-bearing stem in each year have been computed. The results are given in Table No. 1.

INFECTION ASSURES AS CHECKED, B. C., 1956

By

B. T. Myers

Agent

INTRODUCTION

With the discovery of blister rust in the West in 1921 and the treating of artificial infection cankers in Washington and Oregon in 1922, it became apparent that information was necessary on the habits of the disease on native hosts under western conditions. Consequently, studies of the spread of the rust from these on plots were started in 1923 near Chehalis, Wash. Shortly thereafter plots were established near Ashford, Wash. Destruction by fire in 1933 of the more pleasing plot on the plot established for three studies necessitated the reestablishment of the plantation in 1934.

PURPOSE

The Cheelye plot was established for the purpose of ascertaining the maximum distance the rust will spread from native Ribes to western white pine under Ideal conditions on the west. Other studies that are being conducted at the same time are providing information on (1) the survival of Cronartium ribicola, (2) the rate of killing of young white pines by blister rust, and (3) the comparative susceptibility of several species of white pine.

WORK DONE IN 1934

In May 1934, ten years after the last artificial inoculation, all of the study plots were examined. Growth, foliage and infection data were recorded for each living tree and infection data for each dead tree. Each number from one classified according to the year of cycle in which the canker first developed.

RESULTS

A. Pine Growth

Following reestablishment of the plot in 1926, the examination of all cleaned plots on the area has been made each year except 1931 and 1933. The height of each tree has been recorded at every inspection and the number of basal bearing stem of each tree has been taken each year since 1930. From these data on 678 representative trees, the average height and average amount of annual-bearing stem in each year have been computed. The results are given in Table No. 1.

TABLE NO. 1

AVERAGE HEIGHT AND FEET OF NEEDLE BEARING STEM OF PLANTED PINES, CHEEKYE PLOT, B. C.

Year of Exam.	Av. Hgt. of Pines (ft.)	Av. F.N.B.S. of Pines
1926	0.30*	0.20*
1927	0.36	0.50*
1928	0.51	.90*
1929	0.67	1.75*
1930	1.07	3.41
1931	1.52*	7.50*
1932	2.16	17.13
1934**	3.18	39.00

* Estimates

**Data taken before 1934 growth was added. Therefore averages are as of the fall of 1933.

It is shown in Table No. 1 that the increase in tree height was relatively slow for the first four years after planting. Starting with 1930, there have been four years of more rapid height growth, the greatest of which was the average growth of 1.02 feet which was produced in 1933 and measured in May 1934. The increase in the number of feet of needle bearing stem which occurs on all lateral branches as well as on the leader, is at a much greater rate than the increase in height. It is notable that the more rapid rate of foliage increase started in 1930 coincident with the beginning of the increase in the rate of height growth.

It will be shown later that a very large number of cankers was formed in 1932. It is notable in Table No. 1 that there was a large increase in needle-bearing stem during this year. Since the 1933 growth added sufficient foliage to more than double the amount of foliage per tree in 1932, it is expected that a tremendous number of cankers was formed in 1933. Undoubtedly the cankers from this wave of infection will hasten the death of a large number of the trees.

In 1934 it was found that the 3,378 living trees ranged in height from one-half foot to eight and one-half feet and that the number of feet of needle-bearing stem on each varied from one-half foot to 200 feet. The distribution of all trees by height classes and the average height and average number of feet of needle-bearing stem of the trees in each class are given in Table No. 2.

TABLE NO. 1

Year of Growth	Av. Ht. of Trees (ft.)	No. Trees per Acre
1929	0.3*	7,324
1930	0.9	0.8*
1931	0.4	.4*
1932	0.7	1.7*
1933	1.2	3.1
1934	1.8	7.8
1935	2.6	17.3
1936**	3.8	36.0

* Estimates

**Data taken before 1936 growth was added. Therefore averages are as of the fall of 1935.

TABLE NO. 2

DISTRIBUTION OF PINES BY HEIGHT CLASSES
CHEEKYE PLOT, B. C., 1934

Height Class (feet)	Number Living Trees	Percent of Total Trees	Average Height
.5-1.5	296	8.8	1.1
1.6-2.5	628	18.6	2.1
2.6-3.5	1,078	31.9	3.1
3.6-4.5	883	26.1	4.0
4.6-5.5	390	11.5	5.0
5.6-8.5	103	3.1	6.1
All	3,378	100.0	3.3

Table No. 2 shows that the largest number of pines in any single group is in the 2.6 to 3.5-foot height class. However, the number of pines in the next highest group is sufficient to give a total of 58 percent of all pines ranging from 2.6 to 4.5 feet in height. It is significant that 3.1 percent of all pines were between 5.6 feet and 8.5 feet in height.

B. Pine Infection Data

From the inspections of pines in six of the past eight years data have been secured on the progress of the disease on the plot. The summary of these data is given in Table No. 3.

TABLE NO. 3

PROGRESS OF PINE INFECTION ON THE CHEEKYE PLOT, B. C.
1926-1934

Year Data Taken	Number Pines Exam.	Percent of Planted Pines	Total Number Pines Infected	Percent Pines Infected	Total Number Cankers	Number Cankers per Infected Tree	Number Cankers per 100 Ft.B.S.
1926	4,927	100.0		Pines Planted			
1927	4,349	85.2	46	1.1	49	1.0	3
1928	4,133	82.9	240	5.8	247	1.0	8
1929	4,084	81.9	324	7.9	339	1.0	5
1930	4,047	81.2	610	15.1	660	1.1	3
1931				No examination			
1932	4,002	80.2	2,084	52.1	3,088	1.5	5
1933				No examination			
1934	3,956	79.3	3,220	81.4	9,120	2.8	7

Table No. 3 shows that in 1927 one year after planting, 1.1 percent of the transplants were infected. In each year of examination since 1927 additional

TABLE NO. 2

DISTRIBUTION OF STAND AT MATURE CLASSES
CHESTNUT POST, N. C., 1934

Height Class (feet)	Number Live Trees	Percent of Total Trees	Average Height
3.5-4.5	296	8.6	3.7
4.6-5.5	658	18.8	5.3
5.6-6.5	1,078	30.9	6.1
6.6-7.5	985	28.1	6.9
7.6-8.5	360	11.5	8.0
8.6-9.5	109	3.1	9.1
All	3,496	100.0	6.4

Table No. 2 shows that the largest number of trees in any single class is in the 6.6 to 7.5-foot height class. However, the number of trees in the next highest group is sufficient to give a total of 36 percent of all trees ranging from 7.6 to 9.5 feet in height. It is significant that 3.1 percent of all trees were between 8.6 feet and 8.5 feet in height.

B. Pine Infection Data

From the inspections of trees in the plot the past eight years data have been secured on the progress of the disease on this plot. The summary of these data is given in Table No. 3.

TABLE NO. 3

PROGRESS OF PINE INFECTION ON THE CHESTNUT PLOT, N. C.
1928-1934

Year Data Taken	Number Trees Trees.	Percent of Planted Trees	Total Number Pines Infected	Percent Pines Infected- ed	Total Number Cankers	Number Cankers per Infected- ed Tree	Number Cankers per 100 Tr. T. T.
1928	4,917	100.0	Trees Planted				
1929	5,048	88.3	46	1.1	46	1.0	1
1930	4,152	80.0	240	5.9	247	1.0	6
1931	4,054	82.5	284	7.6	339	1.0	8
1932	4,048	82.3	410	10.1	550	1.3	13
1933	No examination						
1934	4,008	80.2	2,084	55.1	3,284	1.5	82
1935	No examination						
1936	3,956	78.3	3,220	81.4	5,130	2.4	7

Table No. 3 shows that in 1927 one year after planting, 1.1 percent of the transplants were infected. In each year of examination since 1930 additional

infected trees have been found until a total of 81.4 percent of the total number examined were infected in 1934. It is evident from these data that plantations of white pine growing under conditions comparable to those at Cheekye will be rendered valueless by the rust in less than a decade.

It is notable in Table No. 3 that with the increase in the number of infected trees there was also an increase in the average number of cankers per infected tree. Referring to Table No. 1 it is seen that each year there has been an increase in the amount of foliage. It is evident that this increase in foliage or rust target has been accompanied by an increase in both the number of infected trees and the number of cankers on each. This leads to the conclusion that almost every tree on the plot will have visible infection within ten years after the establishment of the plantation.

Of considerable importance is the rate of death of white pines by blister rust as compared with the rate of death by all other causes. Since about 15 percent of the transplants died from causes other than blister rust during the first one and one-half years after planting, the comparison of death from blister rust with death from all other causes is based on the number of trees living in the fall of 1927. This comparison is given in Table No. 4.

TABLE NO. 4

COMPARISON OF MORTALITY OF PINES FROM BLISTER RUST WITH MORTALITY FROM ALL OTHER CAUSES, CHEEKYE PLOT, B. C.

(Basis is 4,249 Pines)

Year of Exam.	Pines Dead from Blister Rust		Pines Dead from Other Causes	
	No.	Percent	No.	Percent
1927	0	0.0	0	0.0
1928	4	Neg.	116	2.7
1929	40	0.9	165	4.0
1930	96	2.3	202	4.8
1931	No Examination			
1932	293	6.9	247	5.8
1933	No Examination			
1934	575	13.5	293	7.9

It is notable in Table No. 4 that blister rust was the cause of the death of four trees just two years after the pines were planted. In this same year, 1928, 2.7 percent of the trees were found dead from all other causes. During each succeeding year additional dead trees in each catagory were found. Of particular importance is the fact that between the third and fourth year following planting the number of pines killed by blister rust exceeded the number of pines killed by all other causes. By the sixth year after planting the total number of pines killed by blister rust exceeded the total number killed by all other causes.

In order to predict the rate at which the infected pines will be killed, an analysis was made to determine the length of time it took the disease to kill the pines found dead in 1934. The results are given in Table No. 5.

ed valueless by the rust in less than a decade.

It is notable in Table No. 3 that with the increase in the number of infected trees there was also an increase in the average number of counters per infected tree. Referring to Table No. 1 it is seen that each year there has been an increase in the amount of foliage. It is evident that this increase in foliage over that which has been accumulated by an increase in both the number of infected trees and the number of counters on each. This leads to the conclusion that almost every tree on the plot will have visible infection within ten years after the establishment of the plantation.

Of considerable importance is the fact of death of white pines by blister rust as compared with the fate of death by all other causes. Since about 1% percent of the transmonte died from causes other than blister rust during the first one and one-half years after planting, the comparison of death from blister rust with death from all other causes is based on the number of trees living in the fall of 1927. This comparison is given in Table No. 4.

TABLE NO. 4

COMPARISON OF MORTALITY OF TREES FROM BLISTER RUST AND MORTALITY FROM ALL OTHER CAUSES, CHESTNUT RUST, N. Y.

Year of Exam.	Trees Dead from Blister Rust		Trees Dead from Other Causes	
	No.	Percent	No.	Percent
1925	0	0.0	0	0.0
1926	4	Rec.	116	2.7
1927	40	C.=	186	4.0
1928	96	2.3	216	4.2
1929		No Examination		
1930	252	4.9	272	5.6
1931		No Examination		
1932	305	12.8	298	7.6

It is notable in Table No. 4 that blister rust was the cause of the death of four trees just two years after the plots were planted. In this year, 1928, 2.7 percent of the trees were found dead from all other causes. During each succeeding year additional dead trees in each category were found. Of importance is the fact that between the first and fourth year following planting the number of trees killed by blister rust exceeded the number of trees killed by all other causes. By the ninth year after planting the total number of trees killed by blister rust exceeded the total number killed by all other causes. By the ninth year after planting 12.8 percent of the trees had been killed by blister rust and 7.6 percent by all other causes.

In order to predict the rate at which the diseased trees will be killed, an analysis was made in relation to the length of time it took the disease to kill the trees found dead in 1932. The results are given in Table No. 5.

TABLE NO. 5

DISTRIBUTION OF PINES KILLED BY BLISTER RUST BY HEIGHT CLASSES AND TIME BETWEEN INFECTION OF THE NEEDLES AND DEATH OF TREES, CHEEKYE PLOT, B. C. 1934

Height Classes of Pines (ft.)	Number of Pines Dead From Blister Rust In Years After the Infection of Needles*							
	2 yrs.	3 yrs.	4 yrs.	5 yrs.	6 yrs.	7 yrs.	**?	All
0-0.5	16	36	19	12	2		3	88
.6-1.5	13	71	88	79	19	5	2	277
1.6-2.5	1	23	61	44	7		1	137
2.6-3.5		10	31	16	3	1		61
3.6-4.5			6	3	2			11
4.6-5.5				1				1
Totals	30	140	205	155	33	6	6	575

* On strength of canker data, one year incubation period was used.
**These pines were dead when first cankers were discovered; year canker should have appeared could not be determined.

It is shown in Table No. 5 that blister rust has killed the planted pines in from two to seven years. The largest number were killed in four years and about 92 percent of the total succumbed in two to five years. It is also shown that the largest number of dead trees were between 0.6 foot and 1.5 feet in height when killed, and that over 87 percent were under 2.5 feet in height. Applying these results to the total number of living infected trees that were found in 1934, it is calculated that about one-half of the pines on the plot will have been killed by blister rust within the decade following planting.

From the canker data secured in 1934, the distribution of cankers according to the years of growth infected and stages of canker development has been made. This analysis is given in Table No. 6.

Distribution of Class Limits in Diameter, Basal Area, and Volume
Classified Data Taken Before Logging in Compartment 5
Lake State Forest, Ontario Project, 1924

Diameter Classes of Trees (in.)	Number of Trees per Acre Before Logging*						
	1 Yrs. Before	4 Yrs. Before	8 Yrs. Before	12 Yrs. Before	16 Yrs. Before	20 Yrs. Before	All**
0-0.5	16	34	18	2		2	86
.6-1.5	15	71	58	29	19	5	2	207
1.6-2.5	1	25	51	44	7		1	129
2.6-3.5		10	23	16	5	1		51
3.6-4.5			5	3	2			10
4.6-5.5				1				1
Totals	32	140	209	185	33	8	3	478

* On account of cutter data, one year interruption period was used.
**These plots were used when first counters were discovered; previous counters should have apparent could not be determined.

It is shown in Table No. 5 that blister rust has killed the planted pines in from two to seven years. The largest number were killed in four years and about 82 percent of the total accounted in two to five years. It is also shown that the largest number of dead trees were between 0.6 feet and 1.5 feet in height when killed, and that over 87 percent were under 2.5 feet in height. Applying these results to the total number of living infected trees that were found in 1924, it is calculated that about one-half of the pines on the plot will have been killed by blister rust within the decade following planting.

From the counter data secured in 1924, the classification of counters according to the years of growth intercepted and stages of counter development has been made. This analysis is given in Table No. 6.

TABLE NO. 6

CANKER ANALYSIS, CHEEKYE PLOT, B. C.
1934

Year of Growth Infected	Discolor	Pycnial Scars	Fruited 1	Fruited 2	Fruited Several	Aecia Retarded	Dead	?	Total
1932	214	24	11				1		250
1931	1,993	422	309	16		24	13		2,777
1930	1,232	809	1,155	164	9	116	80		3,565
1929	88	193	434	252	92	191	111		1,361
1928	1	19	31	74	211	67	182		585
1927		1	3	15	81	16	126		242
1926				1	12	4	148		165
1925				1	2	1	144		148
1924					1		5		6
?		3			4	1	9	4	21
Total	3,528	1,471	1,943	523	412	420	819	4	9,120

As indicated in a footnote of Table No. 5, a one-year incubation period for the planted pines is used. Although evidence of this has been secured each year that the pines were examined, the data in Table No. 6 makes the point very clear.

Examination in 1934 was in early May during the time of aecial production but before the start of pycnial exudation. All cankers on 1932 growth could have been formed only in 1932 or 1933 since these were the only years in which the 1932 growth was extant. Therefore, the 11 cankers producing aecia for the first time and the 24 cankers bearing pycnial scars, all on 1932 growth, were visible and produced pycnia in 1933. Since it is highly improbable that a needle infection in 1933 would result in a pycnia-producing canker in the same year, it follows that the 35 cankers developed from needle infection in 1932.

Since the infection of 1932 caused cankers on the several years of growth that bore needles in that year and the majority of these cankers formed on wood older than that produced in 1932, many of the cankers with pycnial scars or first aecia were of 1932 origin. In addition, most of the cankers classed under "discolorations" originated in 1932. This is based on the belief that very few 1933 origin cankers would be visible in May 1934, and on the fact that none of the 3,528 incipient cankers were on 1933 growth. It is indicated, therefore, that a large number of the 6,942 cankers in the first three columns of Table No. 6 resulted from needle infections in 1932.

C. Pine Susceptibility Study

In October 1930, 28 small pine susceptibility plantations were established on or near the plot. In each about equal numbers of Pinus monticola, P. strobus, P. lambertiana and P. flexilis were planted. Examination in 1934 of the surviving pines showed infection of the pines to be quite general in each plantation. The summary of data is given in Table No. 7.

Culex fatigans, Control Plot, S. S.
1934

Type of Crosses Effected	Ute-rine	Proximal Ovaria	Ipsilat. Tubes	Ipsilat. Parous	Ipsilat. Nullip.	Contra-lat. Parous	Contra-lat. Nullip.	Total
1&2&	2&4	24	11				1	2&3
1&2%	1,2&2	&2&	&&&	16	&4	14	&,1&7	
1&3%	1,2&2	&&2	1,135	164	0	116	&,&&2	
1&4%	1,2&2	&&2	1,135	164	0	116	&,&&2	
1&5%	1,2&2	&&2	1,135	164	0	116	&,&&2	

TABLE NO. 7

SUMMARY OF DATA FROM THE PINE SUSCEPTIBILITY PLOTS

CHEEKYE PLOT, B. C., 1934

Species	No. Planted	No. Examined	Percent Surv.	No. Infected	Percent Inf.	Total Number Cankers	No. Cankers per 100 F. N. B. S.
P. lamb.	955	157	16.4	22	14.0	27	12.2
P. mont.	960	674	70.2	130	19.3	161	7.4
P. flex.	939	783	83.4	150	19.2	161	12.9
P. strobus	945	809	85.6	110	13.6	120	4.7
All Species	3,799	2,423	63.8	412	17.0	469	7.7

The survival of P. lambertiana was very low, probably because the planting stock was larger and older than the usual transplants. A fairly high percent of P. strobus and P. flexilis survived while only a fair percent of the P. monticola became established.

Enough infection was visible on the pines of each species to give a fair idea of their comparative susceptibility. It is notable that on the basis of the percent of total trees infected one order of susceptibility is obtained while on the basis of the amount of infection per 100 feet of needle-bearing stem we secure another order. Since the most accurate measure is one based on equal amounts of target for the spores to hit, the results using the second basis are accepted. These show P. flexilis to be the most susceptible followed in order by P. lambertiana, P. monticola and P. strobus.

SUMMARY

1. The average height of the pines on the Cheekye Plot increased very slowly from the time of planting in 1926 through 1929. In each of the succeeding four years the rate of growth increased. With an average growth of 1.02 feet in 1933, the height of the average tree was 3.18 feet in May 1934.

2. The number of feet of needle-bearing stem per tree increased slowly from 1926 to 1929. Each year thereafter the growth rate of foliage increased. In 1934 it was found that the average tree had 39 feet of needle-bearing stem at the end of 1933.

3. At the close of 1933 the height of the trees ranged from 0.5 foot to 8.5 feet and the amount of needle-bearing stem varied from 0.5 foot to 200 feet.

4. Seven years of rust spread to the pines on the plot has resulted in the infection of 81.4 percent of the pines with 9,120 cankers. This is an average of 2.8 cankers per infected tree.

5. In the seven years following discovery of the first infected planted pine, 13.5 percent of the pines have been killed by the disease. In this same period only 7.9 percent of the trees have died from all other causes.

TABLE NO. 7

SURVEY OF TYPE AND PINE SUSCEPTIBILITY CLASS
CHEROKEE PLOT, N. C. 1934

Species	No. of trees	No. Crum-bled	Per-cent Burn.	No. Infect-ed	Per-cent Infec.	Total Number Cankers	Cankers per 100 N. W. B.
P. taeda	355	127	35.8	25	19.0	27	12.2
P. rigida	860	674	70.2	130	19.3	161	7.4
P. virginiana	1,251	784	62.6	130	16.2	161	12.9
P. echinata	945	604	86.8	110	18.5	120	4.7
All Species	3,411	2,189	65.3	405	17.0	469	7.7

The survival of P. taeda was very low, probably because the planting stock was larger and older than the usual stock planted. A fairly high percent of P. echinata and P. virginiana survived while only a fair percent of the P. monticola became established.

Enough infection was visible on the pines of each species to give a fair idea of the comparative susceptibility. It is notable that on the basis of the percent of total trees infected the order of susceptibility is obtained quite on the basis of the number of infections per 100 feet of merchantable bole as measure another order. Since the most accurate measure is the one based on equal amounts of target for the spores to hit, the results using the second basis are accurate. These show P. virginiana to be the most susceptible followed in order by P. taeda, P. rigida, P. monticola and P. echinata.

SUMMARY

1. The average height of the pines on the Cherokee Plot increased very slowly from the time of planting in 1928 through 1933. In each of the succeeding four years the rate of growth increased. With an average yearly of 1.02 feet in 1933, the height of the average tree was 7.12 feet in May 1934.

2. The number of feet of needle-bearing stem per tree increased slowly from 1928 to 1930. Each year thereafter the growth rate of foliage increased. In 1934 it was found that the average tree had 29 feet of needle-bearing stem at the end of 1933.

3. As the close of 1933 the height of the trees ranged from 0.6 foot to 8.5 feet and the amount of needle-bearing stem varied from 0.5 foot to 20.0 feet.

4. Seven years of rust spread to the pines on the plot has resulted in the infection of 81.4 percent of the pines with 9,438 cankers. This is an average of 2.8 cankers per infected tree.

5. In the seven years following discovery of the first infected pine, 12.2 percent of the pines have been killed by the disease. In this same period only 7.3 percent of the trees have died from all other causes.

6. The dead pines have been killed in from two to seven years after infection but about 92 percent died in from two to five years.

7. Over 87 percent of the dead trees were not over 2.5 feet in height.

8. A very large number of cankers were formed in 1932 coincident with the production of a large amount of needle-bearing stem.

9. On the basis of the number of cankers per 100 feet of needle-bearing stem the pine susceptibility data for four species show P. flexilis to be the most susceptible followed in order by P. lambertiana, P. monticola and P. strobus.

6. The dead pines have been killed in from two to seven years after infection but about 92 percent died in from two to five years.

THE INFLUENCE OF WEATHER ON THE INFECTION OF PINES
NEWMAN LAKE, WASHINGTON, 1934

By
E. L. Joy
Associate Forester

INTRODUCTION

The infection of Ribes and pines by white pine blister rust is to a great extent, dependent upon favorable weather at the time the infecting sporidia are produced. The production of the infecting sporidia is also very much influenced by weather. Therefore, in order to more fully understand the habits of the disease under western conditions, it is essential that we determine the weather conditions that are most conducive to infection. This we have set about to do by the controlled exposure of potted pines to infected Ribes.

PURPOSE

The major purpose of this study is to ascertain the influence of weather, particularly temperature and relative humidity, on the infection of white pines with blister rust. From the data secured during this study, it will also be possible to draw some conclusions anent the relative susceptibility of several species of white pine, the ability of Ribes lacustre to infect the various species of white pine, and the length of time required for the incubation of the rust in the needles of such pines.

LOCATION OF WORK

This study is being conducted near Newman Lake, Washington. The exposures of the pines were made on the Newman Lake plot after which the trees were planted in rows on a protected area about three miles distant.

PINE STOCK

Approximately 600 transplants each of Pinus strobus, P. monticola, P. aristata, P. peuce and P. flexilis were obtained from the Forest Service nurseries at Haugan, Montana and Monument, Colorado. These were potted in waxed paper pots and set in a shaded nursery site until needed.

RIBES INFECTION

During the last week in April, two R. lacustre bushes on the Newman Lake plot were inoculated with fresh aeciospores collected from cankers on the nearby pines. Both bushes showed abundant uredinial infection in the middle of May and the first telia on May 28. Only one bush was used for the exposure of pines during the season.

PINE EXPOSURE

Starting on May 28, when telia were first found, sets of potted pines were exposed to infected R. lacustre. Each set, consisting of from 3 to 5 pines of each of the species except P. peuce, was given a 24-hour exposure to

THE INFLUENCE OF WEATHER ON THE INFECTION OF PINES BY *CRONARTIUM RIBICOLA*, HIGGINS LAKE, ROSCOMMON, 1954

By

R. L. Doy

Associate Forester

INTRODUCTION

The infection of pines and pines by white pine blister rust is to a great extent, dependent upon favorable weather at the time the fungus sporidia are produced. The production of the infecting spores is also very much influenced by weather. Therefore, in order to more fully understand the habit of the disease under western conditions, it is essential that we determine the weather conditions that are most conducive to infection. This we have set about to do by the controlled exposure of potted pines to infected ribes.

PURPOSE

The major purpose of this study is to ascertain the influence of weather, particularly temperature and relative humidity, on the infection of white pines with blister rust. From the data secured during this study, it will also be possible to draw some conclusions among the relative susceptibility of several species of white pine, the ability of *Ribes lacustre* to infect the various species of white pine, and the length of time required for the germination of the rust in the needles of such pines.

LOCATION OF WORK

This study is being conducted near Newman Lake, Washington. The exposures of the pines were made on the Newman Lake plot after which the trees were planted in rows on a protected area about three miles distant.

PINE STOCK

Approximately 800 transplants each of *Pinus strobus*, *P. monticola*, *P. ponderosa* and *P. flexilis* were obtained from the Forest Service nurseries at Dungen, Montana and Moscow, Colorado. These were pulled in waxed paper pots and set in a shaded nursery site until needed.

RIBES INFECTION

During the last week in April, two *R. lacustre* bushes on the Newman Lake plot were inoculated with fresh aeciospores collected from cankers on the nearby pines. Both bushes showed abundant uredinial infection in the middle of May and the first rain on May 7th. Only one bush was used for the exposure of pines during the season.

PINE EXPOSURE

Starting on May 26, when rain was first found, sets of potted pines were exposed in infected *R. lacustre*. Each set, consisting of from 3 to 6 pines of each of the species except *P. ponderosa*, was given a 24-hour exposure to

the infected R. lacustre. P. peuce was included in each set from August 10 to October 15, the last date of the exposures. After 24 hours of exposure to the infected R. lacustre, each set was planted in a protected area where periodical examinations will be made to determine the amount of infection developing. Unexposed check trees of each species were also planted on the protected area.

Weather data for each exposure period were secured from a cooperative weather station operated near the exposure location. Of greatest value will be the temperature, relative humidity and precipitation records obtained.

On October 15, the pines in the plantation were examined in order to determine the number that were surviving. The results are given in Table No. 1.

TABLE NO. 1

PINE EXPOSURE STUDY, NEWMAN LAKE, WASHINGTON, 1934

Species	Exposure Dates	No. of Exposure Days	Number Exposed Daily	Total Number Exposed	Number Surviving Oct. 15
P. strobus	5/28 - 10/11	137	3	411	392
P. monticola	5/28 - 10/2	128	5	642	618
	10/3	1	2		
P. aristata	5/28 - 10/2	128	5	641	554
	10/3	1	1		
P. peuce	8/10 - 10/15	67	5	335	335
P. flexilis	5/28 - 9/21				
	10/6 - 10/15	127	5	638	594
	10/3	1	3		
All	5/28 - 10/15	-	-	2,667	2,493

Species	Exposure Dates	No. of Exposure Days	Number Exposed Daily	Total Number Exposed	Number Surviving Oct. 15
A. [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B. [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
C. [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
D. [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
E. [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
F. [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
All	[illegible]	-	-	[illegible]	[illegible]

A STUDY OF THE MOVEMENT OF THE MYCELIUM OF CRONARTIUM RIBICOLA FISCHER DURING THE INCUBATION PERIOD IN PINUS MONTICOLA DOUG.

By
C. M. Chapman
Agent

INTRODUCTION

In order to determine the effectiveness of Ribes eradication in controlling white pine blister rust in the West, it is necessary to segregate the cankers of pine infection centers into two groups; namely, those that originated before and those that originated after the removal of Ribes. Obviously it is imperative that we have an accurate method of determining the year of origin of cankers before they can be assigned to these two groups. One of the most important factors that enters into this determination is the length of the rust incubation period. The incubation period is defined as that time from infection of the needle to appearance of the disease as a discoloration of the bark at the base of the infected needle.

During the winter of 1933-34, the writer inaugurated a study of the development and growth of the mycelium of the rust during the incubation period. This study was conducted at the School of Forestry of the University of Idaho where the necessary greenhouse and laboratory facilities were available.

PURPOSE

The purpose of this study is to ascertain the rate of progress of the rust mycelium down the needle from the time of the initial infection by the sporidial germ tube until infection is clearly visible as a discoloration of the bark at the base of the infected needle.

METHODS AND MATERIAL USED

To provide the pine needle material for this study, native grown western white pine seedlings 6 to 8 years old and 6 to 18 inches high were selected. These trees, originally growing in a rust-free area, were potted in the field in native soil and exposed to infected Ribes petiolare under natural field conditions from September 3 to October 11, 1933. From November 1, 1933, to October 15, 1934 needles with rust infection spots were collected at intervals of from 4 to 15 days and fixed in formal-acetic-alcohol. The needles that were collected between December 1, 1933 and April 11, 1934 were prepared in three mm. lengths, dehydrated with alcohol, cleared with xylene, infiltrated with soft paraffin, imbedded in hard paraffin, and sectioned to a thickness of 10 microns with a rotary microtome. The sections were then fixed on slides with Haupt's fixative, stained with safranin red and fast green, mounted with Canadian balsam and examined with a modern microscope.

A STUDY OF THE MOVEMENT OF THE NUCLEUS OF CHROMATIUM MINUTUM.

By

G. M. Chapman

Agent

INTRODUCTION



Figure 1. Longitudinal section showing mycelial body between mesophyll cells and vascular system. X250.

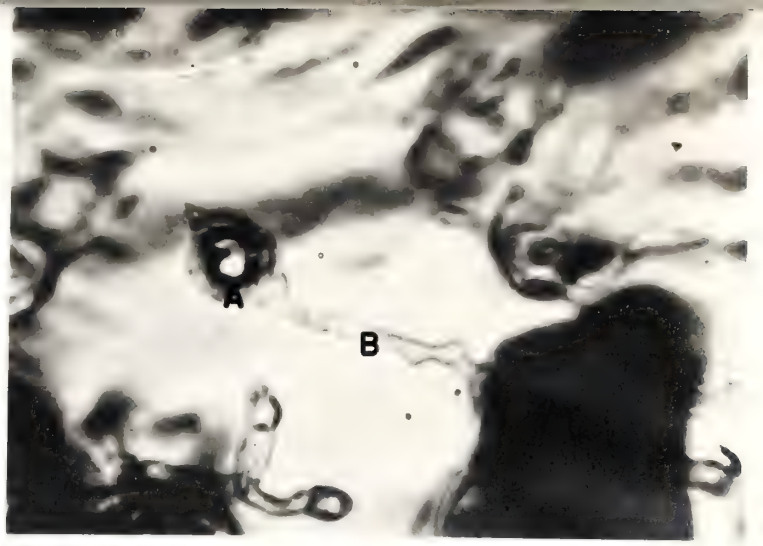


Figure 2. Longitudinal section showing substomatal vesicle and primary hyphae beneath stoma. X1350.

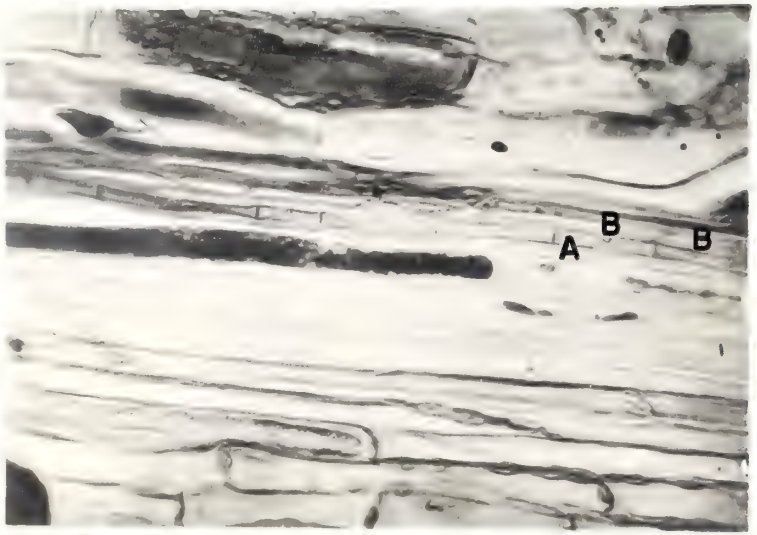


Figure 4. Longitudinal section showing mycelial strand in phloem side of vascular system, descending toward base of needle. X540.

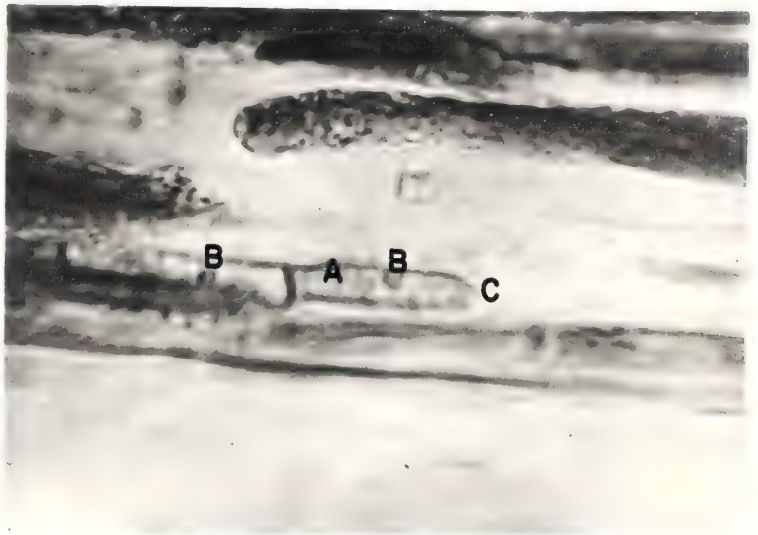


Figure 3. Longitudinal section of mycelial strand showing puncturing hypha tip in central cylinder. X1350.

RESULTS

The first visible needle infection spots were found on November 1. That is, from three to eight weeks after exposure, the point of entrance of the sporidial germ tube was marked by a lemon-yellow discoloration of the needle tissue. Examination of sections cut through these infection points shows that this discoloration results from the accumulation of mycelium in a compact body (Figure 1, A) during the three to eight week period after the entrance of the stoma by the germ tube and formation of the substomatal vesicle (Figure 2, A) and the primary hypha, (Figure 2, B).

The substomatal vesicle is formed immediately beneath the stoma, probably at the end of the sporidial germ tube. It is believed that this vesicle develops after nuclear division has occurred in the sporidium and a nucleus has travelled to the end of the germ tube. After the formation of the vesicle, which is normally the shape of a spear-head, the primary hypha is born. The invasion by the hypha of the host cells marks the definite beginning of parasitism of the pine.

After the formation of the primary hypha, there is a rapid growth of the mycelium in the vicinity of the stoma through which the germ tube entered. Referring to Figure 1 it is notable that the bulk of this mycelium is in a mass (A) between the mesophyll cells (B) and the endodermal sheath (C). It is believed that this body of mycelium which is developed during the fall and winter months, breaks down the endodermal cells so the mycelium can progress into and down the central cylinder, and stores food for the growth of such mycelium.

From the examination of needle sections, it was found that the downward movement of the mycelium through the phloem side of the vascular system had started by January 24, 1934, or 15 to 20 weeks after the needle infection occurred. Figures 3 and 4 each show an individual strand of mycelium (A) in the central cylinder. In each strand the cell division is clearly shown and several cell nuclei (B,B) are evident. In Figure 3 (C) the penetrating tip of the strand is shown.

For each set of needles examined, measurements were made of the distance down the needles from the infection spots that the mycelium had travelled. These measurements are given in Table No. 1.

RESULTS

The first visible needle infection spots were found on November 1. That is, from three to eight weeks after exposure, the point of entrance of the saprophytic germ tube was marked by a lemon-yellow discoloration of the needle tissue. Examination of sections cut through these infection points shows that this discoloration results from the accumulation of mycelium in a compact body (Figure 1, A) during the three to eight week period after the entrance of the stoma by the germ tube and formation of the substomatal vesicle (Figure 2, A) and the primary hyphe. (Figure 2, B).

The substomatal vesicle is formed immediately beneath the stoma, proba-
bly at the end of the saprophytic germ tube. It is believed that this vesicle
develops after nuclear division has occurred in the sporidium and a nucleus has
traveled to the end of the germ tube. After the formation of the vesicle, which
is normally the shape of a sperm-head, the primary hyphe is given off by
the hyphe of the host cells marks the definite beginning of [illegible]

After the formation of the primary hyphe, there is a rapid growth of the
mycelium in the vicinity of the stoma through which the germ tube entered. Refer-
ring to Figure 1 it is notable that the bulk of this mycelium is in a mass (A)
between the mesophyll cells (B) and the [illegible] (C). It is believed
that this body of mycelium which is developed during the fall and winter months,
contains even the sporidial cells as the mycelium ages [illegible]
central cylinder, and stores food for the growth of such mycelium.

From the examination of needle sections, it was found that the downward
movement of the mycelium through the [illegible] of the vascular system [illegible]
ed by January 24, 1934, or 18 to 20 weeks after the needle infection occurred.
cylinder. In each strand the cell division is clearly shown and several cell
[illegible] (2,3) are evident. In Figure 3 (D) the penetrating tip of the stroma is
shown.

For each set of needles examined, measurements were made of the distance
from the needles from the infection spots that the mycelium had traveled. These
measurements are given in Table No. 1.

TABLE NO. 1

DISTANCE MYCELIUM HAS GROWN DOWNWARD IN NEEDLES EXPOSED SEPTEMBER 3 TO OCTOBER 11, 1933

Date Collected and Fixed	Total No. of Needle Spots Exam.	Distance in mm. Mycelium Has Grown from Spot Downward																																No. of Infections Reaching Base
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	
12/1/33	4	4																																		0
12/9/33	8	8																																		0
12/20/33	12	12																																		0
1/2/34	18	18																																		0
1/13/34	15	15																																		0
1/24/34	16	15				1																														0
1/29/34	12	10					2																													0
2/3/34	18	14				2				2																										0
2/13/34	21	16						3				1			1																					0
2/20/34	15	7					4			1			1				2																			0
2/24/34	10	0		1			1			2		3					3																			0
3/5/34	10	0				1					2				2		2										1			1					1	2
3/11/34	10	0				1			2		1				2		1			1				2												0
3/19/34	10	0						1			1				2		2							1						1				2		1
3/28/34	10	0						1			1				2		2			1				1		1				1						1
4/2/34	10	0			1			1				1		1			3				1					1									1	7
4/11/34	10	0										4			2		1				1				1		1									9

Table No. 1

DISTRICT WISE AND AREA WISE NUMBER OF INDUSTRIAL DISPUTES IN THE STATE OF KERALA DURING THE YEAR 1977

| Name of the Taluk | Total No. of Industrial Disputes pending at the beginning of the year | Total No. of Industrial Disputes arising during the year | Total No. of Industrial Disputes pending at the end of the year | Total No. of Industrial Disputes in which strikes occurred during the year | Total No. of Industrial Disputes in which lockouts occurred during the year | Total No. of Industrial Disputes in which strikes and lockouts occurred during the year | Total No. of Industrial Disputes in which neither strikes nor lockouts occurred during the year | Total No. of Industrial Disputes in which settlements were reached during the year | Total No. of Industrial Disputes in which awards were given during the year | Total No. of Industrial Disputes in which other methods were adopted during the year | Total No. of Industrial Disputes in which no methods were adopted during the year | Total No. of Industrial Disputes in which the number of workers involved was less than 100 | Total No. of Industrial Disputes in which the number of workers involved was between 100 and 500 | Total No. of Industrial Disputes in which the number of workers involved was between 500 and 1000 | Total No. of Industrial Disputes in which the number of workers involved was more than 1000 | Total No. of Industrial Disputes in which the number of workers involved was not known | Total No. of Industrial Disputes in which the number of workers involved was not applicable | Total No. of Industrial Disputes in which the number of workers involved was not stated | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known or not applicable | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known or not applicable or not stated | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known or not applicable or not stated or not known | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known | Total No. of Industrial Disputes in which the number of workers involved was not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable or not stated or not known or not applicable

Table No. 1 shows that growth of mycelium in the central cylinder started about January 24. Needles from each collection made subsequent to that date showed that the strands were rapidly progressing toward the bases of the needles. By February 24 all infected needles that were examined had mycelium growing downward and on March 5 the strands had reached the bases of two needles. Thus, the period from the date of needle infection to the date when the mycelium was about to enter the stem was from 21 to 26 weeks.

The first discoloration of the bark at the base of an infected needle was visible on April 2, 25 to 30 weeks after the infection occurred. Thus, the growth of the mycelium in the bark for only about 4 weeks is sufficient to cause a visible discoloration of the bark. Pycniospores appeared on June 28 which is 37 to 42 weeks after exposure and about 12 weeks after the canker appeared. About every 10 days during the summer the study trees were examined for additional incipient cankers. Table No. 2 shows the number of cankers found on each inspection date and the years of growth on which these cankers occurred.

TABLE NO. 2

CANKERS FOUND IN 1934 ON PINES EXPOSED IN 1933

Date of Inspection	No. Weeks Incubation	Number of Cankers					Accumulative Total	Approximate No. Cankers Visible Each Month	Percent of Total Cankers
		Year Growth							
		1933	1932	1931	1930	All			
April 2	25-30	0	1	1	0	2	2		
7	26-31	0	1	0	0	1	3		
18	27-32	2	1	2	0	5	8		
24	28-33	0	8	3	0	11	19		
28	29-34	0	6	3	0	9	28	April	
May 6	30-35	0	12	7	0	19	47	47	15
15	31-36	2	11	1	0	14	61	May	
June 4	34-39	31	89	40	8	168	229	182	60
14	35-40	8	7	0	1	16	245		
24	37-42	6	5	0	0	11	256	June	
July 4	38-43	5	2	0	0	7	263	34	11
14	40-45	3	1	1	0	5	268		
24	41-46	3	0	1	0	4	272	July	
Aug. 3	43-48	4	1	0	0	5	277	14	5
13	44-49	2	0	0	0	2	279		
23	45-50	5	2	0	0	7	286		
Sept. 2	47-52	8	0	1	0	9	295	Aug. 18	6
12	48-53	3	1	4	0	8	303		
22	50-55	1	0	0	0	1	304	Sept.	
Oct. 2	51-56	0	0	0	0	0	304	9	3
12	53-58	1	0	0	0	1	305	Oct. 1	0
Totals	25-58	84	148	64	9	305	305	All 305	100
Percent of Total Canker on Each Growth		28	48	21	3	100			

Table No. 1 shows the growth of mycelium in the central cylinder of the needles about January 24. Needles were collection were discontinued to this date owing to the extreme cold. It was found that the hyphae had reached the base of the needles. By February 24 all infected needles were examined and in terms of the stages had reached the bases of the needles. Time, the period from the date of needle infection to the date when the mycelium was about to enter the stem was from 21 to 36 weeks.

The first discoloration of the bark at the base of an infected needle was visible on April 2, 22 to 30 weeks after the infection occurred. Thus, the growth of the mycelium in the bark for only about 8 weeks is sufficient to cause a visible discoloration of the bark. Examinations operated on June 27 which is 22 to 42 weeks after exposure only about 12 weeks after the cankers appeared. About every 10 days during the summer the study trees were examined for additional infection cankers. Table No. 2 shows the number of cankers found in each inspection date and the years of growth on which these cankers occurred.

TABLE NO. 2

CANKERS FOUND IN 1924 ON PINUS RESINOSA IN 1923

Date of Inspection	No. Weeks Inoculation	Number of Cankers						Approximate No. Branche Visible Each Whorl	Percent of Total Cankers
		Year Growth					Accumulative Total		
		1923	1924	1925	1926				
April 2	22–30	0	1	1	0		2		
7	23–31	0	1	0	0		1		
16	27–36	2	1	2	0		5		
24	28–37	0	3	5	0	11	19	April 7	
29	29–38	0	6	0	0		3		
May 7	30–39	0	12	7	0	19	47		16
15	33–32	2	11	1	0	14	81	May 7	
June 4	34–42	22	69	46	8	169	320	1+2	60
14	36–44	8	7	3	1	18	61		
25	37–45	0	5	0	0	11	256		
July 4	38–46	18	2	0	0	7	252	4+5	31
14	40–48	3	1	1	0	6	166		
24	41–49	8	0	1	0	4	273		
Aug. 5	42–50	4	1	0	0	3	277	6+7	34
14	43–51	2	0	0	0	2	279		
30	45–53	6	3	0	0	7	295		
Sept. 7	47–55	2	0	1	0	3	298	Aug. 18	6
15	48–56	3	1	4	0	8	306		
29	50–58	1	0	0	0	1	307	Sept.	
Oct. 7	51–59	0	0	0	0	0	307	1	7
15	52–60	1	0	0	0	1	308	Oct. 1	0
Totals	25–60	84	145	84	9	326	308	All Sept.	100
Percent of Total Cankers on Each Growth		28	48	21	3	100			

Table No. 2 shows that in a period ranging from 25 to 58 weeks after pine infection, a total of 305 cankers appeared. It is notable that 168 or 55.1 percent of all cankers found during the season were visible for the first time on June 4. This date is 34 to 39 weeks after needle infection. Undoubtedly the majority of these cankers resulted from infection that occurred during a very short period when there was a coincidence of abundant sporidia and favorable weather.

Although the 305 cankers were distributed over the internodes of four years, 97 percent were on the growths of the three years from 1931 to 1933. The 1932 growth, which was one year old at the time of exposure, supported 48 percent of the cankers.

SUMMARY

1. The mycelium of the rust continues to be active when the pine is in winter dormacy.

2. Two hundred and nine needle spots were selected, prepared, sectioned and examined to determine the rate of progress of the rust mycelium. All had a definite accumulation of mycelium under each spot.

3. Below each point of infection the mycelium accumulates in a body between the mesophyll cells and the endodermal sheath, eventually breaking into the vascular system probably by physical force and enzymatic action.

4. Needle spots first became visible from 3 to 8 weeks after infection of the needles.

5. Mycelial strands started growing toward the needle bases 15 to 20 weeks after infection. Single strands of mycelium can be followed down through the phloem side of the vascular system with a remarkable degree of accuracy.

6. The mycelium reached the needle base 21 to 26 weeks after infection.

7. The bark at the base of an infected needle does not become discolored until about 4 weeks after the mycelium has reached the base of the needle sheath which is 25 to 30 weeks after infection.

8. A total of 305 cankers appeared between April 2 and October 12. Of this number 55 percent became visible between May 15 and June 4.

9. The 305 cankers found appeared on the internodes of four years, distributed as follows: 28 percent on 1933 growth, 48 percent on 1932 growth, 21 percent on 1931 growth, and 3 percent on 1930 growth.

Table No. 2 shows that in a period ranging from 28 to 30 weeks after
vice inoculation, a total of 300 conidia ejaculated. It is notable that as
percent of all conidia found during the season were voided by the first shower
hour 4. This date is 24 to 30 weeks after needle infection. Undoubtedly the
majority of these conidia resulted from infections that occurred during a very
short period when there was a coincidence of abundant sporulation and favorable
weather.

Although the 300 conidia were distributed over the interval of two
years, 27 percent were on the grounds of the three years from 1931 to 1933.
The 1930 growth, which was the first in all the time of exposure, supplied 62
percent of the conidia.

Summary

1. The mycelium of the rust condition to be native when the pine is in
winter dormancy.

2. Two hundred and nine needle sheath were selected, treated, examined
and examined to determine the rate of progress of the rust mycelium. All but a
definite accumulation of mycelium under each spot.

3. Below each point of infection the mycelium accumulates in a body
between the mesophyll cells and the endodermal sheath, eventually breaking into
the vascular system probably by physical force and enzymatic action.

4. Needle sheaths first become visible from 3 to 4 weeks after infection
of the needles.

5. Mycelial strands started growing toward the needle bases 12 to 20
weeks after infection. Single strands of mycelium can be followed down through
the phloem also of the vascular system with a resultant decay of wood tissue.

6. The mycelium reached the needle base 21 to 24 weeks after infection.

7. The bark at the base of an infected needle does not become discolor-
ed until about 4 weeks after the mycelium has reached the base of the needle.
sheath which is 25 to 30 weeks after infection.

8. A total of 300 conidia appeared between April 1 and October 15. Of
this number 86 percent became visible between May 15 and June 8.

9. The 1930 crop appeared on the internodes of four years,
distributed as follows: 62 percent on 1930 growth, 26 percent on 1931 growth, 11
percent on 1932 growth, and 1 percent on 1933 growth.

SCOUTING FOR WHITE PINE BLISTER RUST IN THE INLAND EMPIRE, 1934

By
Leiton E. Nelson
Agent

INTRODUCTION

The only intensive scouting work done in 1934 consisted of one week's searching for the rust in the Upper Priest River drainage by members of the disease study project. However, general scouting was done incidental to their regular work by members of all projects. By this method parts of northeastern Washington, northern Idaho and western Montana were scouted with the result that new pine infection centers were found in each state.

SCOUTING IN THE UPPER PRIEST RIVER DRAINAGE

One of the earliest experimental Ribes eradication projects carried on in the Inland Empire was the control work performed on areas in the Upper Priest River drainage in 1924 and 1925. Although blister rust workers on various assignments have scouted in this drainage in recent years during the course of other work, no intensive searching was done until 1934. The work done in this year included the scouting along all principal streams and trails, in patches of white pine reproduction and in burns on an area extending for about 10 miles south from the Canadian border.

Abundant western white pine occurs throughout the drainage and a scattering of white-bark pine grows along the highest ridges. Ribes are very scattered on all of the areas worked in 1924 and 1925, the greatest numbers of survivors growing along trails and streams and in old burns. However, large numbers of Ribes grow on the areas above the upper limits of the early Ribes eradication work, especially along the ridges where Ribes viscosissimum is abundant. Although parts of the areas scouted seem favorable for the establishment of the rust, no infection was found. The number of each species of white pine and Ribes that were examined is as follows: Pinus monticola, 1,716; P. albicaulis, 20; R. lacustre, 241; R. viscosissimum, 183.

RESULTS OF SCOUTING IN THE INLAND EMPIRE

Previous to 1934, 90 pine infection centers had been found in the Inland Empire. As a result of scouting by various members of the personnel along with other field work, 39 additional centers were reported in 1934. Of particular importance is the discovery of eight centers in northeastern Washington and northern Idaho on the Kaniksu National Forest, one center in Idaho on the Lolo National Forest and four centers in Montana on the Cabinet National Forest. These are the first records of pine infection within the boundaries of the forest units named and the first records of pine infection in Montana.

SCOUTING FOR WHITE PINE BLISTER RUST
IN THE INLAND EMPIRE, 1934

By
Leiton K. Nelson

INTRODUCTION

The only intensive scouting work done in 1934 consisted of one week's scouting for the rust in the Upper Priest River drainage by members of the white pine study project. However, general scouting was done incidental to their regular work by members of all projects. By this method parts of Bonner, Kootenai, Shoshone, Benewah and Latah counties in Idaho and western Montana were scouted with the result that new pine infection centers were found in each state.

SCOUTING IN THE UPPER PRIEST RIVER DRAINAGE

One of the earliest experimental blister eradication projects carried on in the Inland Empire was the control work performed on areas in the Upper Priest River drainage in 1924 and 1925. Although blister rust centers on various scattered areas have been scouted in this drainage in recent years during the course of other work, no intensive scouting was done until 1934. The work done in this area included the scouting along all principal streams and trails, in portions of white pine reproduction and in areas on or near cutovers for about 10 miles south from the Canadian border.

RESULTS OF SCOUTING IN THE INLAND EMPIRE

Previous to 1934, 91 pine infection centers had been found in the Inland Empire. As a result of scouting by various members of the personnel along with other field work, 29 additional centers were reported in 1934. Of particular importance is the discovery of eight centers in Latah County, Idaho on the Potlatch Forest and four centers in Shoshone County on the Coeur d'Alene National Forest, one center in Kootenai County, Idaho on the Kaniksu National Forest, one center in Benewah County, Idaho and certain Bonner County, Idaho centers connected with the central Montana.

The total of 129 pine infection centers found to date includes centers found each year since 1922. Table No. 1 shows the distribution of these by forest units and the years in which they were located.

TABLE NO. 1

NUMBER OF KNOWN PINE INFECTION CENTERS FOUND EACH YEAR ON EACH FOREST UNIT

State	Forest Unit	Number of Pine Infection Centers Found							
		1928	1929	1930	1931	1932	1933	1934	Total
Wash.	Newman Lake	1							1
	Kaniksu National Forest							3	3
Idaho	Kaniksu National Forest							5	5
	Coeur d'Alene National Forest				2	5	1	2	10
	St. Joe National Forest		1	2	28	4	2	14	51
	Potlatch Timber Protective Association		2	4	7		3		16
	Clearwater Timber Prot. Ass'n.		1	4	7	3	6	7	28
	Clearwater National Forest			1	1	4	1	3	10
	Lolo National Forest							1	1
Mont.	Cabinet National Forest							4	4
Total		1	4	11	45	16	13	39	129

It is shown in Table No. 1 that 105 centers of pine infection or 81 percent of all known centers are on the St. Joe and Clearwater National Forests and the Potlatch and Clearwater Timber Protective Associations. This is primarily due to the fact that these units contain large amounts of R. petiolare. This species has been found in association with 90 centers or 70 percent of all known centers of infection.

Of the 129 known centers at least 15 were started in 1933, the year the disease entered the Inland Empire. Although the year of origin has not been determined for several centers found in 1934, descriptions of the infection conditions on these areas indicate that they were all started since 1923. If this be true, the results of scouting to date show that for every introductory center there have been started 8.6 additional centers.

Table No. 2 shows the location, year of discovery, year of origin and Ribes species associated with each known pine infection center in the Inland Empire.

State	Forest Unit	Number of Stands Infected During Summer						
		1958	1959	1960	1961	1962	1963	Total
	Pierce Lake	1						1
Penn.	Hamilton National Forest						3	3
	Hanlyn National Forest						5	5
	Ouray Alpine National Forest			3	5	1	1	10
	Mt. Poe National Forest	1	3	23	4	7	14	53
	Potlatch Timber Protective Association	3	4	7		3		15
	Cleavwater Timber Protective	1	4	7	3	6	7	28
	Cleavwater National Forest		1	1	4	1	3	10
Idaho	Nola National Forest						1	1
Mont.	Colony National Park						4	4
Total		1	4	11	45	16	18	39 129

TABLE NO. 2

KNOWN PINE INFECTION CENTERS IN THE INLAND EMPIRE, 1934

County and State	Location	T.	R.	Sec.	Year Found	Year Origin	Associated Ribes
	Kaniksu National Forest						
Bonner, Idaho	Priest River	58N	5W	1	1934	*	P, L, In
Boundary, Idaho	Soldier Creek	60N	3W	27	1934	*	V, L
	Soldier Creek	60N	3W	28	1934	*	V, L
	Soldier Creek	60N	3W	34	1934	*	V, L
	Cougar Creek	60N	3W	30	1934	*	V, L
Pend Oreille, Washington	Upper West Branch Priest River	35N	45E	36	1934	*	L, In
	Middle Fork Tunnel Creek	32N	46E	7	1934	*	L, In
	North Fork Tunnel Creek	32N	46E	7	1934	*	L, In
	Coeur d'Alene National Forest						
Shoshone, Idaho	South Fork Coeur d'Alene River	48N	6E	35	1931	1927	P, V, L
	Brown Creek	50N	3E	14	1931	1926	L, V
	Rock City Administrative Site	52N	3E	29	1932	1928-29	L, V
	Emery Creek	52N	3E	33	1932	1929	L, V
	Van Hoosier Creek	52N	2E	30	1932	1928-29	L, V
	Scott Creek	50N	2E	24	1932	1926-27	L, V
Kootenai, Idaho				7,8			
	Burnt Cabin Creek	51N	1W	17,18	1932	1923	L, In
	Bottom Creek	51N	2W	11	1933	*	L, In
	Callis Creek	52N	1E	18	1934	*	L, V
	Delaney Creek	51N	1W	26	1934	1926	L, V
	St. Joe National Forest						
Shoshone, Idaho	St. Maries River	42N	2E	5, 8, 11	1929	1923	P, In, V, L
	Merry Creek	43N	2E	33	1930	1927	P,T,In,V,L
	Hammond Creek	46N	5E	25	1930	1927	P, V, L
	Railroad Creek	47N	5E	28	1931	1927	P, V, L
	Champion Creek	47N	5E	27	1931	1927	P, V, L
	No-Name Creek	47N	5E	34	1931	1928	P, V, L
	Lucky Swede Creek	46N	6E	6	1931	1927	P,V,L,Ir.
	Little North Fork St. Joe River	46N	6E	6	1931	1927	P,V,L,Ir.
	Ward Creek	46N	7E	20	1931	1927	P, V, L
	Kelly Creek	46N	7E	7	1931	1927	P, V, L
	Turkey Creek	46N	7E	18	1931	1927	P, V, L
	Cliff Creek	47N	6E	35	1931	1927	P, V, L
	Loop Creek	46N	6E	4	1931	1927	P,In,V,L
	Loop Creek	46N	6E	12	1931	1927	P,In,V,L
	Loop Creek	46N	7E	18	1931	1927	P,In,V,L
	St. Joe River	45N	6E	22	1931	1927	Ir, V, L
	St. Joe River	45N	6E	23	1931	1927	Ir, V, L
	Bird Creek	45N	6E	13	1931	1927	P, V, Ir, L
	Kyle Creek	46N	5E	13	1931	1927	P, V, L
	Fishhook Creek	45N	5E	17	1931	1927	V, L
	Fishhook Creek	45N	5E	17	1931	1927	V, L
	Fishhook Creek	45N	5E	20	1931	1927	V, L
	Fishhook Creek	44N	5E	4,5,8,9	1931	1923	P, V, Ir, L
	Slate Creek	47N	4E	36	1931	1927	P,In,Ir,V,L
	Slate Creek	46N	4E	14	1931	1927	P,In,Ir,V,L
	Slate Creek	46N	4E	27	1931	1927	P,In,Ir,V,L
	St. Joe River	45N	3E	6	1931	1927	V, L
	Pine Creek	47N	1E	13	1931	1927	Ir, V, L
				4,5,7			
	Mica Creek	44N	2E	8, 17	1931	1923	P, V, L
	Marble Creek	44N	2E	34	1931	1926	P, V, L
	Marble Creek	44N	2E	35	1931	1927	P, V, L
	Rougin Creek	47N	5E	15	1932	1927-28	P, L
	St. Maries River	43N	1E	36	1932	1927	P, In, L
Benewah, Idaho	Olson Creek	43N	1E	16	1932	1929	P, L
				14,16,20			
	Crystal Creek	44N	1E	21,29,31	1932	1923	P, L, V
Shoshone, Idaho	Mazie Creek	42N	1E	14	1933	1927-28	P, L
	Mazie Creek	42N	1E	23,24	1933	1927-28	P, L
Latah, Idaho				8, 9			
	Emerald Creek	42N	1E	17,18	1934	*	P, L
	Potlatch Creek	41N	1W	22	1934	*	L, V
	Shea Meadow	41N	1W	33	1934	*	L, V
Shoshone, Idaho	Fitzgerald Gulch	46N	1E	12	1934	*	L, V
	Whiterock Mt.	42N	3E	17	1934	*	L, V
	Kelly Creek	45N	5E	27	1934	*	L, V
	Cedar Creek	46N	4E	12	1934	*	L, V
	St. Joe River	45N	6E	13	1934	*	L, V
	St. Joe River	45N	6E	14	1934	*	L, V
	St. Joe River	45N	6E	24	1934	*	L, V
	Mosquito Creek	44N	8E	32	1934	*	P, L
	Canyon Creek	43N	7E	28	1934	*	P, L
	Bullion Creek	47N	5E	25	1934	*	P, L
	Tolls Creek	44N	2E	26	1934	*	P, L

County and State	Location	T.	R.	Sec.	Year Found	Year Origin	Associated Ribes
	Potlatch Timber Protective Association						
Clearwater, Idaho	Deep-Elk Creek	39N	2E	14	1929	1923	P, Ir, V, L
	Long Meadow-Three Bear Creeks	39N	1E	14	1929	1923	L, V
	Shattuck Creek	40N	2E	28	1930	1927	P, In, V, L
	Johnson Creek	40N	2E	19	1930	1927	P, In, V, L
	Cameron Creek	40N	1E	25	1930	1927	P, L
	Cameron Creek	40N	2E	31	1930	1927	P, L
	Cameron Creek	40N	2E	33	1931	1927	P, L
	Deep Creek	39N	3E	6	1931	1923	P, V, L
	Bull Run Creek	39N	2E	10	1931	1927	P, V, L
	Ruby Creek	40N	1E,1W	16,18,13	1931	1923	P, In, V, L
	East Fork Potlatch Creek	41N	1E	36	1931	1923	P, In, V, L
	Robs Creek	41N	1E	22	1931	1927-28	P, In, V, L
	Elk Creek	40N	2E	14	1931	1927-28	P, In, L
	Elk Creek	40N	2E	11	1933	1927-28	P, In, L
	East Fork Potlatch Creek	41N	1E	25	1933	*	P, L
	Deep Creek	40N	3E	31	1933	*	P, L
	Clearwater Timber Protective Association						
Clearwater, Idaho	North Fork Reeds Creek	38N	5E	16	1929	1927	P, L
	North Fork Reeds Creek	38N	5E	15	1930	1927	P, L
	Quartz Creek	37N	5E	9	1930	1927	P, L
	Orofino Creek	36N	5E	13	1930	1928	P, L, V
	Rhodes Creek	37N	5E	36	1930	1923	P, L, V
	Deer Creek	38N	5E	23,26	1931	1923	P, L
	Parallel Creek	38N	5E	8	1931	1927	P, L, V
	Casey Creek	38N	5E	5	1931	1927	P, L, V
	South Fork Reeds Creek	38N	5E	22	1931	1927	P, L
	South Fork Reeds Creek	38N	5E	26	1931	1927	P, L
	Snake Creek	38N	4E	36	1931	1923	P, L
	Poorman Creek	37N	4E	13	1931	1927	P, L
	Oxford Ranger Station	38N	7E	31	1932	1927	P, L
	Trail Creek	37N	5E	10	1932	1927	P, L
	Alder Creek	38N	5E	9	1932	1927	P, L
	Weaver Creek	38N	5E	1,2,11,12	1933	1927	P, L
	South Fork Reeds Creek	38N	5E	23	1933	*	P, L
	South Fork Deer Creek	38N	5E	13	1933	*	P, L
	Washington Creek	38N	6E	15	1933	*	P, L
	No-Name Creek	40N	6E	26	1933	*	P, L
	Cow Creek	36N	4E	3	1933	*	P, L
	Flume Creek	39N	6E	6	1934	*	P, L
	Alder Creek	39N	5E	25	1934	*	P, L
	Beaver Creek	39N	5E	13	1934	*	P, L
	Schofield Creek	38N	6E	4,5,8	1934	*	P, L
	Washington Creek	38N	6E	17	1934	*	P, L
	Washington Creek	38N	6E	18	1934	*	P, L
	Washington Creek	38N	6E	17	1934	*	P, L
	Clearwater National Forest						
Clearwater, Idaho	Beaver Creek	40N	7E	7	1930	1927	P, L
	Weitas Creek	37N	8E	9,10	1931	1927	P, L, V
	Quartz Creek	40N	8E	22	1932	1927	L, V
	Skull Creek	41N	8E	26	1932	1927	L, V
	North Fork Clearwater River	40N	8E	15	1932	1927	L, V
	Quartz Creek	40N	8E	15	1932	1927	L, V
			6E	24			
	French Creek	37N	7E	7,18,19	1933	1923	P, L, V
	Orogrande Creek	37N	7E	5,6	1934	*	P, L
	Tamarack Creek	37N	7E	9	1934	*	L, V
	Larson Creek - Clearwater River	40N	8E	31	1934	*	P, V, L
	Cabinet National Forest						
Mineral, Montana	Big Creek	18N	30W	8	1934	1927	P, In, L
	Big Creek	19N	30W	33	1934	1927	P, In, L
	Rainy Creek	19N	32W	12	1934	*	P, In, L
	Deer Creek	19N	30W	25	1934	*	P, In, L
	Lolo National Forest						
Idaho, Idaho	Lochsa River	37N	13E	26,35	1934	*	P, L
	Northeast Washington						
		26N		32,33			
Spokane, Washington	Newman Lake, Washington	27N	45E	4,5	1928	1923	In, L

*Year of origin not determined.

Ribes legend: P - Ribes petiolare; L - Ribes lacustre; V - Ribes viscosissimum; In - Ribes inerme; Ir - Ribes irriguum; T - Ribes triste

Annual Report 1934
E. L. Joy

During the season abundant Ribes infection was found in and near pine infection centers and smaller amounts at a few points some distance from the nearest known pine infection. The locations of the latter points are given in Table No. 3.

TABLE NO. 3

LOCATION OF RIBES INFECTIONS FOUND IN 1934

Forest Unit	Location T.	R.	Sec.	Drainage
Kaniksu National Forest	36N	45E	10	Petit Lake
	61N	4W	26	Indian Creek
Coeur d'Alene National Forest	50N	4E	25 28 34 35	Eagle Creek
	51N	1W	16 21	Little North Fork Coeur d'Alene
St. Joe National Forest	44N	1E	3	Renfro Creek
	43N	5E	13	Twin Creek
	44N	1E	9	Renfro Creek
Potlatch Timber Protective Association	41N	3E	34	Breakfast Creek
Cabinet National Forest	27N	32W	4	E.Fk. Bull River
	21N	32W	21	Prospect Creek

SUMMARY

1. Although areas worked in 1924 and 1925 in the Upper Priest River drainage were scouted intensively, no rust was found.

2. Scouting throughout the Inland Empire, which was mainly incidental to other work, resulted in the location of 39 new pine infection centers.

3. The number of known centers of pine infection now totals 129, of which at least 15 originated in 1923.

4. The discovery of eight pine infection centers on the Kaniksu National Forest in Washington and Idaho, one on the Lolo National Forest in Idaho, and four on the Cabinet National Forest in Montana, is of considerable importance since no centers had been found on these units in previous years.

During the season abundant Ribes infection was found in and near pine infection centers and smaller amounts at a few points even distantly from the nearest known pine infection. The locations of the latter points are given in Table No. 3.

TABLE NO. 3

LOCATION OF RIBES INFECTIONS FOUND IN 1934

Forest Unit	Location T.	N.	Sec.	Drainage
Kaniksu National Forest	62N	4E	10	Pettit Lake
Coeur d'Alene National Forest	51N	4W	26	Indian Creek
	50N	4E	25 28 34 35	Eagle Creek
	51N	1W	16 21	Little North Fork Coeur d'Alene
St. Joe National Forest	44N	1E	3	Benfro Creek
	45N	5E	13	Twin Creek
	44N	1E	9	Benfro Creek
Potlatch Timber Protective Association	41N	3E	24	Breakfast Creek
Cabinet National Forest	27N	32W	4	E.Fk. Bull River
	21N	32W	21	Prospect Creek

SUMMARY

1. Although areas worked in 1934 and 1935 in the Upper Priest River drainage were scouted intensively, no rust was found.

2. Scouting throughout the Inland Empire, which was mainly incidental to other work, resulted in the location of 39 new pine infection centers.

3. The number of known centers of pine infection now totals 132, of which at least 15 originated in 1933.

4. The discovery of eight pine infection centers on the Kaniksu National Forest in Washington and Idaho, one on the Lolo National Forest in Idaho, and four on the Cabinet National Forest in Montana, is of considerable importance since no centers had been found on these units in previous years.

PHOTOGRAPHIC AND EDUCATIONAL WORK, 1934

by
R. L. MacLeod
Agent

INTRODUCTION

The educational program in the West has been carried on largely in those states where the protection of white pine is an economic concern and in which blister rust control work is being performed on a practical basis. Any work in other regions has consisted in supplying blister rust material and information in response to definite requests. Educational work in the states of Montana and California has been performed by each State Leader with the aid of bulletins, specimens and display material supplied by the Spokane office. This report therefore deals only with the photographic and educational work of the Spokane office.

With the resignation of the educational project leader in October, 1932 the photographic work became the major function of this department. Any requests for educational work were met by various members of the personnel. As there was no definite responsibility for maintaining an adequate supply of material and bulletins this policy did not result in satisfactory educational work. Consequently, in February, 1934, the department was divided into two sections, photographic and educational, with the writer in charge of the educational section on a full-time basis. H. Miller Cowling, assisted by Dale L. Swartz, continued in charge of the photographic section. On February 15, Wayne E. White, an expert draftsman experienced in photographic work, was appointed to perform the large amount of specialized drafting work required for the photographic section.

PURPOSE

The purpose of the photographic section is to maintain a pictorial record of all phases of investigative and control work, to provide the supervisory field personnel with photographs and maps which will facilitate the successful consummation of control work, to provide an effective means of reducing large maps and charts to a satisfactory report size and to provide the educational section with illustrative material. The purpose of the educational section is to bring to blister rust workers a sound conception of the menace which blister rust constitutes and the importance of effective control work, to bring to the administrators of forest lands a realization of the necessity for action in preserving both actual and potential timber assets, and to supply those not directly concerned with control work with some knowledge of the disease and of the progress and value of control work.

SUMMARY OF WORK

In considering the work accomplished during 1934 in this department the photographic and educational sections are treated separately.

PHOTOGRAPHIC AND EDUCATIONAL WORK, 1934

by

R. D. Macleod

Agent

INTRODUCTION

The educational program in the West has been carried on largely in those states where the prospects of white pine is an economic concern and in which timber rest control work is being performed on a protection basis. Any work in other regions has consisted in supplying timber test material and information in response to definite requests. Educational work in the states of Montana and California has been performed by each State Leader with the aid of bulletins, equipment and display material supplied by the Spokane office. This report therefore deals only with the photographic and educational work of the Spokane office.

With the resignation of the educational project leader in October, 1933 the photographic work became the major function of this department. Any requests for educational work were met by various members of the project. As there was no definite responsibility for maintaining an adequate supply of material and bulletins this policy did not result in satisfactory educational work. Consequently, in February, 1934, the department was divided into sections, photographic and educational, with the writer in charge of the educational section on a full-time basis. R. Miller Upshaw, associated by Dale L. Swarts, continued in charge of the photographic section. On February 10, Wayne L. Kirk, an expert draftsman experienced in photographic work, was appointed to perform the large amount of specialized drafting work required for the photographic section.

PURPOSE

The purpose of the photographic section is to maintain a pictorial record of all phases of investigative and control work, to provide the supervisory field personnel with photographs and maps which will facilitate the successful consummation of control work, to provide in effective manner a reducing large maps and charts to a satisfactory report size and to provide the educational section with illustrative material. The purpose of the educational section is to bring to bear every worthwhile a sound conception of the damage which timber rust constitutes and the importance of effective control work, to bring to the administrators of forest lands a realization of the necessity for acting in preserving both actual and potential timber assets, and to supply that directly concerned with control work with some knowledge of the diseases and of the **progress and value of control work.**

SUMMARY OF WORK

In considering the work accomplished during 1934 in this department the photographic and educational sections are treated separately.

A. Photographic Section

1. Photography in the Office.

From the experience of 1933 when a large volume of photographic work was produced it was evident that certain items of equipment were essential to accomplish the volume of work which was planned for 1934. A cabinet for a bellows-type enlarging camera and Cooper-Hewitt "M" tube was built for enlarging from 8 x 10 negatives. This equipment will permit enlarging photographs to any size required. The old syphon-type print washer was unsuited to use for a large volume of washing. Consequently, a new Monel metal print washer capable of washing up to 200 prints at one time was secured. A new printing machine particularly suited to use in printing aerial pictures, but which will take care of any type of contact printing, was constructed.

With the addition of this new equipment little difficulty was experienced in turning out a large volume of field maps, charts and pictures. The methods of reproducing and coloring large maps and of reducing large maps and tables to annual and special report size, described in the 1933 Annual Report, were used extensively. Eighty-seven pages for the annual report, eleven of which were maps requiring coloring with several oil colors, were copied. Illustrations for the Ribes eradication and checking manuals and for special reports were copied and printed.

A considerable number of large-scale field maps was supplied to the field operations. Maps compiled from aerial photographs were traced, photographed on 8 x 10 film and enlarged to scales of 2 inches and 4 inches to one mile, according to requirements. These maps proved valuable to the field forces as they were made in the most satisfactory scale for field use and gave a more nearly correct picture of their operation areas than any maps hitherto used.

A further development of large-scale-map production was used in enlarging maps and charts for the summary report of the status of blister rust control at the close of the 1934 field season. Maps were photographed in sections, the sections enlarged to required size and reassembled with cloth backing. Maps as large as 7½ x 9 feet were made in this way and colored with from two to seven oil colors showing Ribes eradication data.

2. Photography in the Field.

Both ground and aerial pictures were taken in the field. The ground pictures were taken with a view camera using a 5 x 7 inch film. Seventy-six pictures were taken showing special phases of the work of the Ribes eradication projects on the Coeur d'Alene and St.Joe National Forests, the bulldozer operations on the Coeur d'Alene and Kaniksu National Forests, and the Ribes ecology project. During July, 156 pictures illustrative of control work in Oregon and California were added to the files.

Aerial photographs were secured through the cooperation of the 116th Observation Squadron, 41st Division Aviation, Washington National Guard

A. Photographic Section

1. Photography in the Office.

From the experience of 1938 when a large volume of photographic work was produced it was evident that capable items of equipment were essential to accomplish the volume of work which was planned for 1939. A camera for a miniature enlarging camera and Copar-Negatif "B" film was built for enlarging from 4 x 10 negatives. This equipment will certainly enable us to do a large volume required. The old syphon-type print washer was used in the large volume of washing. Consequently, a new Nessel metal print washer capable of washing up to 24 prints at one time was ordered. A new Argentic Medium particularly suited to rapid printing was constructed.

With the addition of this new equipment it will materially be necessary to increase the volume of field work, charts and pictures. The method of photographing and printing large maps will require new and different equipment. Three-seven hundred (700) annual reports, many special reports and numerous other jobs will be handled by the photographic section.

A considerable number of large-scale field maps were supplied to the field operations. These consisted from aerial photographs were traced, photographed on to negatives and enlarged to scales of 2 inches and 4 inches to one mile, mounting and varnishing. These maps showed relocations to the field forces as they were made in the most satisfactory scale for field use and gave a more nearly correct picture of their operations than any maps hitherto used.

A further development of large-scale mosaics was used in enlarging maps and charts for the [illegible] report of the region of Bilateral control at the close of the 1938 field season. Maps were photographed in sections enlarged to required size and reassembled with cloth backing. Maps 16 inches by 9 x 3 feet were done in this way and colored with line to serve all colors enhancing their application data.

2. Photography in the Field.

Both ground and aerial pictures were taken in the field. The ground pictures were taken with a view camera using a 5 x 7 inch film. Seventy-six pictures were taken showing general phases of the work of the three operations parties on the Coast of Alaska and Bering Sea Aleutian Islands, the Salmon operations on the Coast of Alaska and Yakutat Bay, and the Atlas project.

During July, the pictures illustrative of control work in Oregon and California were added to the files.

Aerial photographs were secured through the cooperation of the 16th Observation Squadron, 41st Division Airplane, Washington National Guard.

in supplying an airplane for this use. Expenses of operation were paid by the Bureau of Entomology and Plant Quarantine.

Fifty-six oblique aerial photographs were taken on the Coeur d'Alene National Forest, two aerial flights were made over the Kaniksu National Forest to procure 36 photographs of the bulldozer operation areas, and 252 aerial photographs were taken during July on flights over the southern Oregon and California control areas.

An aerial mosaic map of 240 square miles of territory near Moscow, Idaho, and Pullman, Washington, was made for the Soil Erosion Service, United States Department of Interior. This map was compiled from 632 vertical pictures taken at an elevation of 11,000 feet above sea level. The Soil Erosion Service paid the salaries of the personnel of this Division while they were engaged in this work. In addition 52 oblique aerial photographs were taken of the Selway National Forest for the U. S. Forest Service.

3. Volume of Work.

The total output of work in the photographic department during 1934 is shown in the following list:

Prints smaller than 5 x 7 inches	220
Prints, 5x7 inches	2,460
Prints, 8x10 inches	3,821
Prints, 9x11 inches	5,177
Enlargements up to 20x24 inches	475
Enlargements larger than 20x24 inches	321
Copies, 5x7 inches	45
Copies, 8x10 inches	166
Lantern slides	140

B. Educational Section

The educational work may be divided into two general phases: (1) work with blister rust personnel and (2) work with the general public.

1. Blister Rust Personnel

a. Monthly News Letter. The Western Blister Rust News Letter was issued to all of the permanent personnel until the start of the field season when the mailing list was expanded to include all of the personnel of the NIRA camps and the supervisory personnel of the CCC camps. This News Letter was discontinued in August, however, when it was superseded by the Bureau News Letter which was made available for distribution.

The Western Blister Rust News Letter represented an excellent medium for the dissemination of up-to-date information on all phases of blister rust work. Full opportunity was presented to all of the personnel to discuss potential improvements in all phases of the work. Plans, results of work and any new ideas or developments were reported to all of the personnel in order that they might be

fully conversant with the work of all projects and have an opportunity to express their ideas on any new developments in the light of their own work.

b. Illustrated Lectures. The success of the Ribes eradication program depends to a large extent on the initiative and sense of responsibility of the men who are actually engaged in the work. It is essential therefore, that the men have a clear conception of the damaging power of the disease and of the necessity for protecting the white pine. The supervisory field personnel consider that the lectures on blister rust, illustrated with lantern slides, are highly effective in showing the true significance of blister rust control and in helping to improve the efficiency of the field work.

From April 23 to May 5 nine lantern slide talks were given by the project leader at training schools for unit supervisors, CCC camp superintendents and foremen and NIRA camp bosses on the Cabinet, Clearwater, Coeur d'Alene, Kaniksu and St. Joe National Forests.

During June, July and August illustrated talks were given at the 42 CCC camps in the Inland Empire, all or part of whose personnel were engaged in blister rust control. Twelve of these talks were given by the educational project leader, the remainder by assistant operation or unit supervisors on the various projects.

c. Educational Material. Blister rust camps in Idaho and Washington were supplied with 400 general bulletins entitled "Blister Rust - A Half-Billion Dollar Menace", by Charles Lathrop Pack, 3,500 copies of Miscellaneous Publication No. 23 and 1,000 copies of a bulletin on the life cycle and history of blister rust written by the project leader. Fifty copies of the Pack bulletin were supplied to the educational advisers in CCC camps of the Lewiston district and 200 copies to the educational advisers in CCC camps of the Fort George Wright district.

Owing to the fact that pine infection centers were located on all control areas it was not considered necessary to supply specimen material to blister rust camps in the Inland Empire.

d. State Leaders. 25 Pack bulletins, 50 life cycle and history pamphlets and 200 copies of Miscellaneous Publication No. 23 were sent to the Montana State Leader for use in blister rust camps in Montana.

The California State Leader was supplied with one large trunk canker, two jars of branch cankers, two enlarged photographs of trunk cankers, 250 Pack bulletins, 600 life history pamphlets and 1,000 copies of Miscellaneous Publication No. 23 for use in educational work during the field season. An additional supply was provided later for use in educational work with the general public. This supply included 6 jars each of preserved uredinal and telial specimens, 500 copies of Miscellaneous Publication No. 22, 1,000 copies of Miscellaneous Publication No. 23, 500 copies of Miscellaneous Publication No. 27, 125 copies of Farmers' Bulletin No. 1398, 100 copies of the Forestry Primer, 40 copies of Miscellaneous Publication No. 162 and 20 copies of Technical Bulletin No. 87.

their ideas on any new developments in the light of their own work.

5. Illustrated Lectures. The success of the Mines exhibition prepared to a large extent on the initiative and advice of [illegible] men who are actually engaged in the work. It is essential however, that the man have a clear conception of the dangerous and of the dangerously for protecting the white pine. The supervisory field personnel consider that the lectures on blister rust, illustrated with lantern slides, are highly effective in showing the true significance of blister rust control and in helping to improve the efficiency of the field work.

Five April 27 to May 5 nine lantern slide talks were given by the project leader at training schools for unit supervisors, CCC camp superintendents and [illegible] and St. Joe National Forests.

During June, July and August illustrated talks were given at the 12 CCC camps in the Idaho Unit, all of part of whose personnel were employed in blister rust control. Twelve of these talks were given by the educational adviser, the remainder by assistant operation or unit supervisors on the various projects.

6. Educational Material. Blister rust exhibits and [illegible] were supplies with 400 General Bulletins entitled "Blister Rust--A Major-Million Dollar Menace", by Charles Lathrop Pack. 1,500 copies of Miscellaneous Publication 4 [illegible] 25 and 1,000 copies of a bulletin on the life cycle and history of blister rust written by the project leader. 3[illegible] copies of the Pack bulletin were supplied to the educational advisers in 200 camps of the Deerlodge district and 200 copies to the educational advisers in 200 camps of the Kaniksu district.

Owing to the fact that nine instruction centers were [illegible] on all account [illegible] it was not considered necessary to supply speakers material to blister rust camps in the Inland Empire.

7. Motion Pictures. 35 [illegible] 80 life cycle and history pamphlets and 200 copies of Miscellaneous Publication No. 30 were sent to the Montana State Leader for use in blister rust camps in Montana.

The California State Leader was supplied with [illegible] two [illegible] of branch culture, two enlarged photographs of trunk canker, 500 Pack bulletins, 600 life history pamphlets and 1,000 copies of Miscellaneous Publication No. 23 for use in educational work during the field season. An additional supply was provided later for use in educational work with the General public. This supply included 6 [illegible] each of preserved wretinal and [illegible] specimens, 500 copies of Miscellaneous Publication No. 27, 1,000 copies of Miscellaneous Publication No. 47, 300 copies of Miscellaneous Publication No. 47, 175 copies of Farmers' Bulletin No. 1328, 100 copies of the Forestry Primer, 45 copies of Miscellaneous Publication No. 152 and 30 copies of Technical Bulletin No. 87.

2. General Public

a. Newspaper and radio. Owing to the great general interest in blister rust control aroused by the advent of the Civilian Conservation Corps and the employment of large numbers of men under the NIRA appropriation, the newspapers were receptive to articles on blister rust. Articles were run periodically in the local newspapers or given to the Associated Press for distribution. In November pictures, bulletins and information on control data were sent to "The Portland Oregonian", Portland, Oregon, for a feature article on white pine blister rust.

A radio talk concerning control work in Jackson County, Oregon was written for the Jackson County Chamber of Commerce and broadcast over Station KMED, Medford, Oregon.

b. Illustrated lectures. Lectures were given by Mr. S. N. Wyckoff to the Reserve Officers' Association at Spokane, Washington and to the Plant Quarantine Board at Salem, Oregon. Talks, illustrated with lantern slides, were given by the project leader to the Men's Club of Knox Presbyterian Church, to the Hoo Hoo and Gyro Clubs at Spokane, Washington; to the Deep Creek Grange, Deep Creek, Washington and to the North Idaho Forestry Association at Headquarters, Idaho.

c. Educational Material. Sets of blister rust material, each set comprising 6 Pack bulletins, 6 mounts each of uredinal and telial specimens, one jar each of preserved uredinal and telial specimens, 6 test tubes containing white pine specimens showing the discoloration and pycnial stages of the rust, 6 test tubes containing specimens of the aecial stage and 21 photographs with legends concerning blister rust and control methods, were made up for distribution to schools and universities. These sets were sent to the Universities of Colorado, Utah and Wyoming.

Thirty-seven Pack bulletins, 37 life-history pamphlets and 125 copies of Miscellaneous Publication No. 33 were sent to individuals requesting information on blister rust.

PLANS AND RECOMMENDATIONS

1. Larger developing sinks and trays should be installed in the dark room. This would greatly facilitate the production of large-scale maps required by the field force.

2. Print-drying equipment of adequate size should be procured. This would obviate the difficulties of producing without any print-drying equipment the large volume of prints now required.

3. Photographs showing damage to pine in the West should be procured. These pictures can be taken in some of the pine stands in the Coast region where the disease has been present for more than 20 years. They would prove invaluable in educational work.

4. With the building up of the supply of specimen and informational material it is planned to carry on all types of educational work on a larger and more effective scale during 1935.

2. General Public

c. Newspaper and radio. During the year several letters in direct response to articles on blister rust appeared in the Civilian Conservation Corps and the Emergency Conservation Work publications. The newspapers were receptive to articles on blister rust. Articles were run periodically in the local newspapers of Grants Pass, Medford, Klamath Falls, and Roseburg. In November pictures, bulletins and information on control date were sent to "The Oregonian", Portland, Oregon, for a feature article on white pine blister rust.

A radio talk concerning control work in Jackson County, Oregon was written for the Jackson County Chamber of Commerce and broadcast over Station KMED, Medford, Oregon.

b. Illustrated Lectures. Lectures were given by Mr. E. W. Kyhoff to the Reserve Officers' Association at Spokane, Washington and to the Tiger Quarterback Club at Salem, Oregon. Talks, illustrated with lantern slides, were given by the project leader to the Men's Club of Knox Presbyterian Church, to the Sea Scout Fire Clubs at Spokane, Washington; to the Deep Creek Lumber, Deep Creek, Washington and to the North Idaho Potatoe Association at Headquarters, Idaho.

c. Educational Material. Sets of slides and material, each containing 5 pen outlines, 5 mounts each of one final and vital specimen, one jar each of preserved material and twelve specimens, 6 test tubes containing white pine specimens showing the diseased and normal stages of the rust, 3 test tubes containing specimens of the aecial stage and 21 photographs with lantern slides covering blister rust and control methods, were sent up for distribution to schools and universities. These sets were sent to the Universities of California, Utah and Wyoming.

Thirty-seven Forest Bulletins, CF Life-History pamphlets and 100 copies of Miscellaneous Publication No. 22 were sent to individuals requesting information on blister rust.

FUTURE AND RECOMMENDATIONS

1. Burned cavalcopiled slash and trees should be inspected in the dark moon. This would greatly facilitate the production of large-scale maps required by the field force.

2. Print-drying equipment of adequate size should be procured. This would obviate the difficulties of processing without any print-drying equipment the large volume of prints now required.

3. Photographs showing damage to pine in the past should be procured. These pictures can be taken in some of the pine stands in the Coeur d'Alene Region where the disease has been present for more than 20 years. They would prove invaluable in educational work.

4. With the publication as of the supply of specimens and instructional material it is planned to carry on all types of educational work on a larger and more effective scale during 1936.

EXPENDITURES BY THE WESTERN DIVISION OF BLISTER RUST CONTROL CALENDAR YEAR 1934

Federal Expenditures

The following tabulations of Federal expenditures for the period January 1, 1934 to June 30, 1934 regular funds, and January 1, 1934 to June 30, 1934 and July 1, 1934 to December 31, 1934, NIRA funds, summarize by projects and objects the expenditures for the Western Division of Blister Rust Control.

These tabulations are prepared from detailed expenditure card records maintained by fiscal years for each project and which show the classification of all expenditures as to objects of expenditure, based on the expenditure classifications required by the Bureau of the Budget and General Accounting Office.

In addition to the expenditures shown by the following tabulations, disbursements were made during the calendar year 1934 by the regional fiscal agent from the $186,000 transferred to the Forest Service for disbursement on April 10, 1934 as follows:

	Total	Salary	Expense
Plumas National Forest	[illegible]	[illegible]	[illegible]
Eldorado National Forest	59,558.44	47,589.74	11,968.70
Stanislaus National Forest	[illegible]	[illegible]	[illegible]
	$176,578.15	$149,503.83	$ 27,074.32

Classifications of the above expenditures by objects are not available on the basis shown for funds disbursed by Miss M. L. Mefeld of the Spokane office for the reason that expenditure records were not retained on this basis by the Forest Service.

In addition to the above Federal expenditures, the State of Idaho contributed funds for Blister Rust Control Work which were expended in the amount of $20,000 of which $345.74 were used to pay the premiums on insurance protection for the employees to be paid from this fund during the calendar year 1934 in the operation of four state camps. The funds contributed by the state were used entirely for wages with the exception of the amount indicated above, which was used for premiums. Under the cooperative arrangement, this Division supplied the supervisory personnel and furnished the equipment necessary.

Federal Expenditures

Forest Control.

These tabulations are prepared from detailed expenditure card records maintained by fiscal years for each project and which show the classification of all accounting as to objects of expenditure, source of the expenditure classification prepared by the Bureau of Public Roads and the General Accounting Office.

In addition to the expenditures shown by the following tabulations, disbursements were made during the calendar year 1934 by the regional fiscal agent from the $100,000 authorized in the Federal Treasury on April 10, 1934 as follows:

	Total	Salary	Expense
Plums National Park			
Blooming National Forest			
Bluebird National Park			

Classifications of the above expenditures by objects are not available at this time for the reason that expenditures receipts only are reported to Washington by the Forest Service.

In addition to the above Federal expenditures, the State of Idaho contributed funds for Blister Rust Control Work which were expended in the protection for the employees to be paid from this fund during the calendar year 1934 in the operation of four state camps. The funds contributed by the state were used entirely for wages with the exception of the amount indicated above, which was used for supplies. Under the cooperative arrangement, this division supplied the supervisory personnel and furnished the equipment necessary.

TABLE NO. 1

FEDERAL EXPENDITURES, WESTERN DIVISION OF BLISTER RUST CONTROL
JANUARY 1, 1934 - JUNE 30, 1934, REGULAR APPROPRIATION

	Project	Salaries	Expenses	Total	Recapitulation of Expenses		
					Equipment*	Other Supplies**	Transportation and Travel***
2.2	Developing Methods of Ribes Eradication						
	2.22-2 - Method Studies of Ribes Eradication, Idaho	$ 20.64		$ 20.64			
2.3	Developing and Testing Ribicides						
	2.3-1 - Laboratory Investigations, Ribicides	5,354.22	$ 226.33	5,580.55	$ 45.10	$ 164.39	$ 16.84
2.4	Field Studies in Ribes Ecology						
	2.42 - Idaho	129.90	1.11	131.01			1.11
3.1	Control Reconnaissance on Federal Lands						
	3.15-1 - Yosemite National Forest, California	352.49		352.49			
	3.15-2 - Sierra National Forest, California	292.50		292.50			
3.2	Cooperative Ribes Eradication on Federal Lands#						
	3.21-2 - Cabinet National Forest, Montana	2,983.66	302.71	3,286.37			302.71
	3.22-1 - Clearwater National Forest, Idaho	1,358.63	11.88	1,370.51			11.88
	3.22-2 - St. Joe National Forest, Idaho	1,825.25	302.70	2,127.95			302.70
	3.22-3 - Coeur d'Alene National Forest, Idaho	2,261.60	42.84	2,304.44			42.84
	3.22-4 - Kaniksu National Forest, Idaho	1,099.89	26.53	1,126.42			26.53
	3.23-1 - Kaniksu National Forest, Washington	567.40	101.12	668.52			101.12
	3.25-1 - Plumas National Forest, California	1,885.21	4.75	1,889.96			4.75
	3.25-3 - Eldorado National Forest, California	1,117.70		1,117.70			
	3.25-4 - Stanislaus National Forest, California	1,086.63		1,086.63			
3.4	Cooperative Ribes Eradication on Private and State Lands##						
	3.42-1 - Clearwater Timber Protective Association, Ida.		7.39	7.39			7.39
	3.42-4 - State of Idaho, Priest Lake, Idaho		18.10	18.10		10.00	8.10
	3.44 - Rogue River Forest, State of Oregon		119.68	119.68			119.68
4.1	Field Studies, Spread of the Rust						
	4.13 - Washington	1,203.72		1,203.72			
	4.14 - Oregon	878.29		878.29			
	4.15 - California	1,549.13	41.22	1,590.35		40.21	1.01
4.2	Damage to Pine Studies	1,023.49	32.18	1,055.67			32.18
5.1	Cooperation with Forest Service, ECW Ribes Eradication on Federal Lands						
	5.12-1 - Clearwater Operation, Idaho	284.88		284.88			
	5.12-2 - St. Joe Operation, Idaho	188.75		188.75			
	5.12-3 - Coeur d'Alene Operation, Idaho	254.74		254.74			
	5.15-1 - Plumas Operation, California	107.27		107.27			
	5.15-3 - Eldorado Operation, California	66.62		66.62			
	5.15-4 - Stanislaus Operation, California	170.17		170.17			
5.2	Cooperation with Forest Service, ECW Ribes Eradication on State and Private Lands						
	5.22-1 - Clearwater Operation, Idaho	99.86		99.86			
	5.22-2 - St. Joe Operation, Idaho	79.83		79.83			
	5.25-1 - Calaveras State Park, California	20.35		20.35			
5.3	Cooperation with Park Service, ECW Ribes Eradication in National Parks ##						
	5.35-1 - Yosemite National Park	369.40		369.40			
	5.35-2 - Sierra National Park	306.88		306.88			
6.	Educational Work, Spokane Office	497.00	132.10	629.10	88.40	1.00	42.70
9.	Maintenance of Field Office and Miscellaneous Expenses						
	9.1 - Supervision	2,050.79		2,050.79			
	9.2 - Office Maintenance	4,567.95	1,803.00	6,370.95		1,803.00	
	9.3 - Miscellaneous Supplies and Services Paid on L/A		109.66	109.66		69.95	39.71
	Total January 1, 1934 - June 30, 1934	$34,054.84	$3,283.30	$37,338.14	$133.50	$2,088.55	$1,061.25

#See also project 5.1 for cost of ECW cooperative Ribes eradication on National Forests.

##See also project 5.3 for cost of ECW cooperative Ribes eradication on National Parks.

###See also project 5.2 for cost of ECW cooperative Ribes eradication on State and Private Lands.

All subsistence supplies purchased and paid for with NIRA funds.

Annual Report 1934
E. G. Schmidt

*Equipment consists only of non-expendable and semi-expendable, does not include cost of any Government cars (cost of cars included in Transportation and Travel).

**Other Supplies consists of the following: office supplies, such as pencils, pens, etc., printing, temporary rents on office machines, telephone and telegraph service, repairs to office and camp equipment, miscellaneous expense.

***Transportation and Travel consists of all expenses incurred in Government cars, railroads, hotels, meals furnished during travel status, cost of Government car (no cars paid from Regular Funds this period), and miscellaneous expense incurred, such as repairs to cars, etc., all freight, packing and trucking charges.

GENERAL SUMMARY, WESTERN CONTROL PROGRAM

Introduction

The western control program was increased greatly in scope during 1934. In the Inland Empire 6,204 men in 42 Civilian Conservation Corps camps were engaged in blister rust control; 4,882 men were employed in 146 NIRA camps operated with funds made available to the Bureau of Entomology and Plant Quarantine and the U. S. Forest Service from the NIRA appropriation and 134 men were employed in cooperative NIRA camps, the Bureau of Entomology and Plant Quarantine and the State of Idaho cooperating. Late in the field season, 400 men were employed with funds made available to the Washington Emergency Relief Administration and 330 men with Idaho Emergency Relief Administration funds. This year marked the commencement of large-scale control work in Montana with 17 NIRA camps, included in the above totals, operating on the Cabinet National Forest.

In Washington, in addition to the camps on the Kaniksu National Forest included in the totals for the Inland Empire, 70 men were engaged in blister rust control in two CCC camps on Mount Rainier National Park. In Oregon three 50-man camps operated on the Rogue River National Forest, one 25-man camp on the Mt. Hood National Forest and one 15-man camp on the Siuslaw National Forest. In California 1,150 men were employed in 34 NIRA camps on the Plumas, Eldorado and Stanislaus National Forests.

Spread of the Rust

The year 1934 marked a further southward extension of the known limits of white pine infection, a pine infection center having been discovered on Steamboat Creek in the upper drainage of the North Umpqua River in Douglas County, approximately 100 miles from California. Scouting in northern California failed to reveal the presence of the rust.

In the Inland Empire, 90 pine infection centers had been located prior to 1934. During 1934, 59 additional centers were reported. Of particular importance is the discovery of eight centers in northeastern Washington and northern Idaho on the Kaniksu National Forest, one center in Idaho on the Lolo National Forest and four centers in Montana on the Cabinet National Forest. This is the first record of pine infection on these forest units and the first record of pine infection in Montana.

Application of Local Control Measures

Ribes Eradication - Inland Empire

Summarization of data on Ribes eradication in the Inland Empire shows that during 1934, 474,108 effective man-days of labor were expended in eradication work on 670,257 acres of western white pine type. Of this 670,257 acres, initial working was completed on 642,948 acres, second working on 25,562 acres and third working on 1,747 acres. 228,011 acres were placed on a maintenance basis. This work includes 393 acres of stream type cleared by the bulldozer method at an average cost of $45.70. Burning was completed on 339.6 acres at a cost of $6.93 per acre, an average cost per acre for this operation of $52.63.

Introduction

The western control program was increased greatly in scope during 1934. In the Inland Empire 6,204 men in 42 Civilian Conservation Corps camps were engaged in blister rust control; 4,882 men were employed in 146 WPA camps operated with funds made available to the Bureau of Entomology and Plant Quarantine and the U. S. Forest Service from the WPA appropriation and 134 men were employed in cooperative WPA camps, the Bureau of Entomology and Plant Quarantine and the State of Idaho cooperating. Late in the field season, 400 men were employed with funds made available to the Washington Emergency Relief Administration and 880 men with Idaho Emergency Relief Administration funds. This year marked the commencement of large-scale control work in Montana with 17 WPA camps, included in the above totals, operating on the Cabinet National Forest.

In Washington, in addition to the camps on the Kamiken National Forest included in the totals for the Inland Empire, 70 men were engaged in blister rust control in two CCC camps on Mount Rainier National Park. In Oregon three CC-man camps operated on the Rogue River National Forest, one 25-man camp on the Mt.Hood National Forest and one 15-man camp on the Siuslaw National Forest. In California 1,180 men were employed in 24 WPA camps on the Plumas, Eldorado and Stanislaus National Forests.

Spread of the Rust

The year 1934 marked a further southward extension of the known limits of white pine infection, a pine infection center having been discovered on Steamboat Creek in the upper drainage of the North Umpqua River in Douglas County, approximately 100 miles from California. Scouting in northern California failed to reveal the presence of the rust.

In the Inland Empire, 80 pine infection centers had been located prior to 1934. During 1934, 89 additional centers were reported. Of particular importance is the discovery of eight centers in northeastern Washington and northern Idaho on the Kamiken National Forest, one center in Idaho on the Nolo National Forest and four centers in Montana on the Cabinet National Forest. This is the first record of pine infection on these forest units and the first record of pine infection in Montana.

Application of Local Control Measures

Summarization of data on Ribes eradication in the Inland Empire show that during 1934, 474,108 effective man-days of labor were expended in eradication work on 670,287 acres of western white pine type. Of this 670,287 acres, initial scouting was completed on 642,948 acres, second scouting on 85,662 acres and third scouting on 1,747 acres. 228,011 acres were placed on a maintenance basis. This work includes 382 acres of stream type cleared by the bulldozer method at an average cost of $45.70. Burning was completed on 806.6 acres at a cost of $6.87 per acre, an average cost per acre for this operation of $7.43.

Ribes eradication work to date in the Inland Empire has been accomplished on 1,129,321 acres of which 1,074,126 acres have been given initial working, 51,463 acres have been given second eradication and a third working has been necessary on 1,747 acres. 375,515 acres are now on a maintenance basis. This work has been accomplished with 6,293,088 man hours of labor.

The results of work during 1934 on each control operation are shown in the following table:

Rides eradication work to date in the Inland Empire has been accomplished on 1,129,821 acres of which 1,074,126 acres have been given initial working, 51,493 acres have been given second eradication and a third working has been necessary on 1,747 acres. [illegible] now on a maintenance basis. This work has been accomplished with [illegible] days of labor.

The results of work during 1934 on each control operation are shown in the following table:

SUMMARY OF RIBES ERADICATION BY CONTROL UNITS

INLAND EMPIRE, 1934

Class of Work	Control Unit	Acres First Working	Acres Second Working	Acres Third Working	Total Effective Man-Days	Total Ribes	Per Acre Basis					
							1st Work.		2nd Work.		3rd Work.*	
							Ribes	Cost	Ribes	Cost	Ribes	Cost
ECW	Clearwater	56,868	1,291	297	52,899	9,739,253	169	--	105	--	49	--
	Coeur d'Alene	44,024	4,407	--	84,488	9,335,810	196	--	157	--	--	--
	Kaniksu	39,660	--	--	24,635	4,378,910	110	--	--	--	--	--
	St. Joe	63,894	2,410	536	71,409	17,899,261	263	--	367	--	342	--
	All Units	204,446	8,108	833	333,431	41,353,234	193	--	111	--	237	--
NIRA Camps	Cabinet	43,988	--	--	24,816	6,811,048	155	$4.69	--	--	--	--
	Clearwater	54,141	3,390	914	43,073	16,170,651	291	6.36	84	$2.13	133	$7.43
	Coeur d'Alene	79,361	3,827	--	55,515	12,486,769	155	5.04	62	3.43	--	--
	Kaniksu	158,949	8,544	--	57,463	17,031,061	105	2.71	34	1.85	--	--
	St. Joe	102,063	1,693	--	59,810	19,841,548	192	4.51	161	4.09	--	--
	All Units	438,502	17,454	914	240,677	72,341,077	162	4.20	62	3.64	133	7.43
ECW and NIRA Camps	All Units	642,948	25,562	1,747	474,108	113,694,311	--	--	--	--	--	--

* Third working is all stream type work.

Class of worker	Occupation	Average daily wage	Average hours worked	Average overtime hours	Total earnings	Earnings for hours worked			Earnings for overtime hours		
						Base pay	Shift premium pay	Other pay	Base pay	Shift premium pay	Other pay
All workers											
Men											
Women											
Full-time workers											
Men											
Women											
Part-time workers											
Men											
Women											
Office clerical workers											
Men											
Women											
Full-time workers											
Men											
Women											
Part-time workers											
Men											
Women											
Technical workers											
Men											
Women											
Full-time workers											
Men											
Women											
Part-time workers											
Men											
Women											

* Denied workers is all women type work.

Washington

Work was continued on Mount Rainier National Park by two crews of 35 men each in two ECW camps. One unit supervisor employed by the Division of Plant Disease Control and two technical foremen employed by the Park Service supervised the work. Ribes eradication was performed on 1,102 acres on the White River area where 176,739 Ribes were pulled in 957 man-days and on 38 acres on the Stevens Creek area where 41,789 Ribes were pulled in 479 man days of labor.

Oregon

In Oregon three 30-man camps were operated on the Rogue River National Forest, one 25-man camp was engaged in the complete reworking of the Still Creek plantation area on the Mt. Hood National Forest and protection work was initiated in one 15-man camp on the Mt. Hebo plantation on the Siuslaw National Forest. The results of this work areshown in the following table:

SUMMARY OF RIBES ERADICATION BY CONTROL UNITS - OREGON, 1934

Control Unit	Acres	Effective Man-Days	Total Ribes Eradicated	Per Acre	
				Ribes	Cost
Rogue River National Forest	22,101.1	6,206	2,141,869	96.9	$ 2.14
Mt. Hood National Forest Still Creek Plantation	2,521.0	1,386	368,844	146.3	3.15
Siuslaw National Forest Mt. Hebo Plantation	480.0	197	68,336	142.4	3.92
Total	25,102.1	7,789	2,579,049	102.7	2.27

California

Ribes eradication work was performed in California during 1934 by 1,130 men in 34 camps on the Eldorado, Plumas and Stanislaus National Forests. During part of the field season 15 laborers from one CCC camp were employed in Ribes eradication working on the Stanislaus National Forest operation. A small number of laborers from the Merced Grove CCC camp worked on Ribes eradication in Yosemite National Park eliminating the Ribes from a strip 20 chains wide along the west boundary of the park adjoining the eradication area on the Stanislaus National Forest.

The results of this work are shown in the following table:

Montana

Work was continued on Mount Rainier National Park by two crews of 25 men each in two CCC camps. One unit reforested the Sylvia Burn Picnic Ground and two technical foremen employed by the Park Service supervised the work. Slope stabilization was performed on 1,275 acres on the Paradise Valley Road. Fifty-five miles were patrolled by CCC men.

Oregon

In Oregon three CC-man camps were operated on the Rogue River National Forest, one CC-man camp was assigned to the complete rewriting of the fire plans for the Mt. Hood National Forest and photographic work was initiated in the CC-man camp on the Mt. Hood planimetric and photographic quadrangle maps. The results of this work are shown in the following table:

Camp No.	Project	Man-Days Worked	Trees Planted	Miles Truck Trail Built
1	Mt. Hood National Forest Fire Plans	1,260		
2	Mt. Hood National Forest Fire Plans	1,260		
3	Mt. Hood National Forest Fire Plans	1,260		
	Total	3,780		

Idaho

Nine projects were performed in California during 1934 by 1,180 men in 24 camps on the Kaibab, Plumas and Stanislaus National Forests. During part of the time about 1/3 laborers from the CCC camps were employed in fighting wildfires working on the Stanislaus National Forest dynamite. A small number of laborers from this forest CCC camp worked on trail construction in Yosemite National Park eliminating the curve from a trail on Mount Hoffman. The most important of the work performed was on the Glacier National Forest.

The results of this work are shown in the following table:

SUMMARY OF RIBES ERADICATION BY CONTROL UNITS - CALIFORNIA, 1934

Class of Work	Control Unit	Acres	Effective Man-Days	Total Ribes Eradicated	Per Acre	
					Ribes	Cost
MIRA	Plumas National Forest	46,142.1	20,532.5	4,899,049	106.0	$3.09
	Eldorado National Forest	59,131.0	13,075.0	7,202,374	121.8	2.45
	Stanislaus National Forest	83,724.5	20,619.0	5,972,916	81.3	1.91
	Total	188,997.6	59,226.5	18,064,339	95.6	2.37
ECW	Stanislaus National Forest	960.0	271.0	28,213	29.4	
	Yosemite National Park	1,715.0	1,341.0	84,691	49.4	
	Total	2,675.0	1,612.0	112,904	42.2	
Grand Totals		191,672.6	60,838.5	18,177,243	94.8	

Checking Efficiency of Ribes Eradication

Checking work was performed on all Ribes eradication operations to insure a satisfactory standard of work. This work was done on the basis of a four percent strip check in upland types and from 8 to 50 percent check in stream type. Any area which did not measure up to a satisfactory standard was reworked and checked again after being reworked.

In addition to assisting in planning the reworking of specific areas, the checking organization assisted in speeding up the work and reducing the cost by running advance check strips which resulted in eliminating comparatively Ribes-free areas from the acreage to be worked.

Control Reconnaissance and Preeradication Survey

Montana

A total of 101,490 acres was covered in a preeradication survey over the principal remaining white pine areas on the Cabinet and Kootenai National Forests.

Idaho

Preeradication surveys were completed on 691,110 acres. This season marked the practical completion of this type of survey making it possible to determine with a high degree of accuracy those areas warranting protection from blister rust and to make a reasonably close estimate of the amount of work necessary to establish control.

Oregon

Control reconnaissance was completed on 71,836 acres at an average cost of $.0315 per acre.

Type of Tax	Jurisdiction	Rate	Effective Tax-Base	Total Taxes Levied	Per Acre Taxes Levied	Per Acre Taxes Paid
Ad Valorem	Stanislaus National Forest	4.16%	$ 4,860,046	$ 202,106.0	$2.00	
	Yosemite National Park	3.75%	7,202,274	270,121.6	2.46	
	Stanislaus National Forest	3.75%	2,276,016	87,735	1.71	
	Total		14,338,336	559,962.6	6.17	
Yosemite	Stanislaus National Forest	2.0%	2,276,016	45,520	$ .45	
	Yosemite National Park	1.25%	1,201,142	15,014	.15	
	Total		3,477,158	60,534	.60	
Grand Totals			17,815,494	620,496.6	6.77	

Checking Efficiency of Tribe Eradication

Checking work was performed on all Tribe eradication operations to insure a satisfactory standard of work. This work was done on the basis of four percent strip check in which type and from 5 to 30 percent check in these type. Any area which did not measure up to a satisfactory standard was checked again after being reworked.

In addition to assisting in planning the reworking of specific areas, [illegible] enabled to spending up the work and treating the entire Tribe-type areas from the acreage to be worked.

Control Recommendations and Prescription Survey

Surveys

A total of 101,460 acres was covered in a prereadication survey over [illegible] areas.

Types

Prereadication surveys were completed on 691,110 acres. This season marked the eventual completion of this type of survey since it consists of observations with a high degree of accuracy since error accounting procedure [illegible] type must now be made a reasonably close estimate of the amount of work necessary to establish control.

Cost

Control reconnaissance was completed on 71,855 acres at an average cost of $.0818 per acre.

California

Control reconnaissance work was done on 356,329 acres of sugar pine type on the Sierra, Eldorado and Stanislaus National Forests and on Yosemite National Park at an average cost of $.038 per acre.

Colorado-Wyoming

A survey of forest lands in Colorado and Wyoming was initiated in 1934 to determine the distribution and value of white pines in these states, to ascertain the numbers and species of Ribes occurring in white pine stands and to determine by means of small-scale control experiments the cost of local control.

The forests of Colorado and Wyoming aggregate approximately thirty-one and one-half million acres within the boundaries of twenty-four National Forests, three National Parks and one Indian Reservation. The results of the survey show that there are over four and one-quarter million acres on twelve National Forests, three National Parks and one Indian Reservation supporting white pine and that over one-half million acres of this area support comparatively valuable white pine stands. It is estimated that the completed survey will show that there are in the two states approximately one million acres which support stands of white pine with relatively high use value.

The five-needled or white pines of the two states are Pinus flexilis (limber pine) which occurs throughout the timbered areas of both states, P. albicaulis (white-bark pine) found in northwestern Wyoming and P. aristata (bristlecone pine) which occurs in all except the extreme northern and northwestern forests of Colorado. The commercial value of the three species of white pine is not great although they provide some railroad ties, mine props, lumber, fence posts and fuel wood. Their chief value lies in their protection of watersheds, prevention of soil erosion, sheltering of wild life and provision of recreational and scenic areas.

Within the stands of white pine eleven species of Ribes were found. In upland types there are from one to 38 Ribes bushes per acre while the moist stream bottoms support from 18 to 279 bushes per acre. The cost of control work in the Inland Empire on areas bearing similar numbers of Ribes indicates that the average cost per acre for upland work in Colorado and Wyoming should be about $.72 and for stream type work about $2.67. The costs in the Central and Southern Rocky Mountain region may be slightly higher than in the Inland Empire, however, due to more difficult working conditions, the occurrence of white pine in relatively small units and the remoteness of the areas. The purpose of the survey will not be attained until definite costs for this region are determined by small-scale experimental operations. Plans are being formulated for carrying on these experimental operations during the coming field season.

Control Investigations

A. Development and Testing of Ribicides

1. California

As a spray and soil drench to intact bushes, Diesel oil proved to be more effective on R. roezli than any other substance. A sodium chlorate-sodium

California

Control recommendations were made in June on [illegible] acres of eight pine type on the Sierra, Eldorado and Stanislaus National Forests and on private land at an average cost of $.[illegible] per acre.

Tuolumne-Mariposa

A survey of dummer trees in Tuolumne and Mariposa was initiated in June to determine the distribution and volume of white pines in these trees, to ascertain the numbers and species of mites occurring in their pine cones and to determine by means of small-scale control experiments the role of insect control.

The forests of Colorado and Wyoming comprise approximately [illegible]-million acres within the boundaries of twenty-four National Forests, three National Parks and one Indian Reservation. The results of the survey show that there are over four and one-quarter million acres on twelve National Forests, three National Parks and one Indian Reservation supporting white pine or high over one-half million acres of this type support commercially valuable stands. It is estimated that the completed survey will show about twice as two states approximately one million acres which support stands of white pine of relatively high use value.

The five-needled or white pines of the two states are Pinus flexilis (limber pine) which occurs throughout the Rocky Mountain region, P. aristata (bristle-cone pine) which is restricted to southwestern Colorado and P. reflexa (southwestern pine) which occurs in small areas in the mountains of southwestern Colorado. The commercial value of the three species of white pine is not great although they provide some valuable lumber, mine props, lumber, fence posts and fuel wood. Their chief value lies in their protection of watersheds, prevention of soil erosion, sheltering of wild life and protection of recreational and scenic areas.

Within the stands of white pine eleven species of mites were found. In general types there are from 20 to 30 pine beetles per acre while forest stands support from 4 to 200 beetles per acre. The cost of control work on the Pinyon Juniper on area bearing similar numbers of Mites indicates that the typical acre per cone for typical work in Colorado and Wyoming should be about $.[illegible] for areas type such about $.[illegible]. The cone is the Central and Southern Rocky Mountain [illegible] may be slightly higher than in the Yellow Pines, however, due to more difficult working conditions. The occurrence of white pine in relatively small units [illegible] the extremes of the areas. The purpose of the survey will not be attained until definite costs for this region are determined by small-scale experimental operations. Plans are being formulated for carrying on these experimental operations during the coming field season.

Control Investigations

1. Investigations and Testing of Biologics

1. California

As a scale and soil insect known to infest bushes, Diaval oil proved to be more effective on P. fragil than any other substance. A medium oil-emulsion

bicarbonate mixture is apparently more effective than straight chlorate.

The decapitation method was uniformly good with Diesel oil or ammonium thiocyanate applied to mutilated crowns of topped bushes in quantities of two to three ounces per bush. Diesel oil should probably be used in all dry sites on R. roezli and R. cereum while ammonium thiocyanate in saturated aqueous solution or in dry form may be more effective on wet sites.

2. Oregon

Diesel oil treatment following decapitation showed every indication of being exceedingly effective on R. cereum.

3. Idaho.

Ammonium thiocyanate is inferior to sodium chlorate as an herbicide on R. petiolare.

Eight hundred pounds of sodium chlorate plus 1,600 pounds of sodium bicarbonate per acre represent a treatment which is fully effective on R. petiolare.

On decapitation tests copper sulphate and sodium fluoride killed 93 and 92 percent of the bushes respectively. Survival was due to insufficient chemical or to improper cutting.

B. Studies in Chemical Eradication Methods.

Atlacide is far superior to ammonium thiocyanate in the eradication of R. petiolare. Late season spraying with Atlacide can be made effective by making ground applications at the rate of 1/10-gal. per square foot using 1.4 to 2 pounds of Atlacide per gallon, depending on moisture conditions in the soil.

C. Studies in Ribes Ecology.

1. Idaho.

It is possible to administer a white pine area in a manner favorable to the inception and survival of white pine reproduction and at the same time unfavorable to the regeneration and survival of Ribes. This is indicated in the results of ecological studies carried on during the past three field seasons in the Inland Empire on the effects of cutting methods on Ribes seed germination and seedling survival.

It has been found that the areas on which no brush had been burned following logging showed the lowest average number of R. viscosissimum. Areas on which the brush was piled and burned showed a 30 percent increase in number of Ribes over areas on which the brush was not burned. The greatest number of Ribes following logging appeared on areas where the timber was clear-cut followed by a broadcast burn not sufficiently intense to consume all of the organic mantle. When a clear-cut logging operation was followed with a broadcast burn heavy enough

The decapitation method was uniformly good with Diesel oil or ammonium thiocyanate applied as suggested above if burned areas be treated before the brush has burned. Diesel oil should always be used in dry form may be more effective on wet slash.

2. Oregon

Diesel oil treatment following decapitation showed every indication of being exceedingly effective on R. cereum.

3. Idaho.

Ammonium thiocyanate is inferior to sodium chlorate as an herbicide on R. radicata.

Eight hundred pounds of sodium chlorate plus 1,600 pounds of sodium thiocyanate per acre produced a thorough kill in only moderately dry slash.

On decapitation tests copper sulphate and sodium fluoride killed 98 per cent of the brushes respectively. Survival was due to inaccurate chemical or to improper cutting.

4. Studies in Chemical Eradication Methods.

Although in the chemical eradication of R. radicata both sodium chlorate and sodium fluoride killed 98 of the roots at 1/10-gallon per square foot using 1:4 in 2 pounds of dilution per gallon, depending on moisture conditions in the soil.

5. Studies in Other Methods.

I. Idaho.

It is possible to eradicate a white pine area of mature trees by the use of cutting methods so that there will be sufficient seed survival and survival of white pine reproduction and at the same time obtain the regeneration and survival of Ribes. This is important in the results of successful control in saving the white pine stand. Tables showing the effects of cutting methods on Ribes seed germination and seedling survival.

It has been found that the areas on which no brush had been burned following logging showed the lowest average number of Ribes per acre. Areas on which the brush was piled and burned showed a 40 percent increase in number of Ribes over areas on which the brush was not burned. The growth habits of Ribes following logging operations on areas where the timber was cleaned by a clear-cut logging operation was followed with a broadcast burn nearly two years after logging but not sufficiently intense to consume all of the organic matter.

to destroy completely the organic mantle and most of the residual trees, the number of Ribes appearing was not much in excess of the number on areas on which the brush was piled and burned since a great many of the stored Ribes seeds were destroyed by the fire.

The number of Ribes seeds germinating on an area depends on the type and degree of disturbance to which the area is subjected. The extent of survival of Ribes seedlings depends on the density of the canopy formed by the residual trees left on an area following the disturbance. On clear-cut areas, 1,900 Ribes per acre remained after four years; on selectively cut areas there was a reduction in numbers of 60 percent the first year and an additional 32 percent during the second and third years, leaving only 86 Ribes per acre after four years.

The type of selective logging practiced on the areas where Ribes were studied was not inhibitory to a fair degree of natural reseeding of white pine. The greatest numbers of white pine seedlings were found on selectively cut areas where the brush was piled and burned. Fifty percent less were found on areas where no burning occurred. Less than one-third the number found on the selective cutting areas were found on areas which were clear-cut followed by brush piling and burning. From the standpoint of both white pine reproduction and Ribes regeneration and survival, logging on a selective basis followed by the piling and burning of brush appears to be the most satisfactory method.

While the results of these studies do not show that judicious logging and burning will inhibit completely the growth of Ribes in any particular area they do indicate that the cost of Ribes eradication in such areas can be lowered materially by a selective type of logging. When eradication work can be delayed for two or three years following brush burning, Nature can be depended on to do more than two-thirds of the eradication work. The selective type of cutting insures a minimum amount of ground disturbance, and leaves the area with a sufficient canopy to make unnecessary the actual pulling of large numbers of Ribes. In other words, it appears certain that R. viscosissimum can be controlled partially by cutting methods.

2. California

a. In stream type, a few Ribes seedlings will appear the year in which logging was done if this were done early in the season, reach a maximum the first and second year following logging and then gradually diminish. Germination still takes place the fifth year but in greatly reduced numbers.

b. On cut-over land in the sugar pine-fir stand where eradication does not take place until four or five years after logging, there is a chance for a large number of heavily fruiting bushes to develop. When these are eradicated but not removed from an area, countless numbers of seeds are left. The germination of these seeds reaches a maximum during the first and second years following eradication and then declines. Seedlings continue to appear four years after in fairly large numbers.

c. Shading-out by brush on a logged-off area, where eradication has not been done, has caused but few bushes to die out in eleven years. The

shading-out process, however, is commencing to manifest itself in the spindly type of Ribes bush now developing.

d. Ribes seeds germinate more readily in mineral soil than in duff or loose layers of coniferous needles. They can push their way through two and one-half inches of soil.

e. A large percentage of bushes cut off at the crowns and left exposed come back as sprouts. When crowns are covered with dirt, there is a decrease in the number which sprout. Excessive heat to which the soil over these crowns is sometimes subjected may account for some of this mortality. Several years elapse before the number of feet of live stem of sprouts equals the original amount of live stem of the decapitated bushes.

D. Field Studies of the Rust

1. Pine Infection Studies.

a. Newman Lake, Washington. A thorough study of all cankers shows that 37 trees have been infected with 67 cankers since the removal of R. inerme in 1929. The 67 cankers caused by infected R. lacustre in the four years from 1929 to 1932 are to be contrasted with 2,204 cankers resulting from infected R. inerme and R. lacustre in 1923 and from 1926 to 1928.

Only 16.5 percent of the 2,340 disease-free white pine transplants planted on the plot in 1931 were alive in 1934. No infection was found on these trees.

b. Cheekye Plot, Cheekye, B. C. Seven years of rust spread to pines on the plot has resulted in the infection of 81.4 percent of the pines with 9,120 cankers, an average of 2.8 cankers per infected tree.

In the seven years following discovery of the first infected planted pine, 13.5 percent of the pines have been killed by the disease. In the same period only 7.9 percent have died from all other causes.

On the basis of number of cankers per 100 feet of needle-bearing stem the pine susceptibility data for four species shows Pinus flexilis to be the most susceptible followed in order by P. lambertiana, P. monticola and P. strobus.

2. Effectiveness of Control Studies.

a. The Growth and Regeneration of Ribes in Stream Type Following Ribes Eradication.

Initial Ribes eradication reduced an average of 39,138 feet of Ribes live stem per acre to 1,675 feet per acre, a 95.6 percent reduction; the second working reduced 2,101 feet of live stem per acre to 577 feet per acre, a reduction of 74.4 percent; the third working reduced 905 feet per acre to 438 feet per acre, a 51.6 percent reduction.

The average annual Ribes live stem increment is 60.7 percent.

The average annual Ribes live stem increment is 60.7 percent.

b. The Effect of Known Amounts of Ribes per Acre in Spreading and Intensifying Blister Rust.

Data have been taken in five pine infection centers where initial Ribes eradication work was performed in 1931 or before, and on four check areas where control work had not been done when the data were taken. On the five areas where control work has been performed, 967 of the 7,701 pines examined or 12.6 percent, were infected prior to control. Since initial eradication work, an additional 40 trees have been infected, making a total of 13.2 percent of the pines infected, an increase of only .6 percent since eradication.

On the four check areas 32 of the 1,155 pines examined, or 2.8 percent were infected prior to 1930. An additional 318 trees were infected from 1930 to 1932, making a total of 30.8 percent of the pines infected, an increase of 28 percent.

The increase of 28 percent of pines infected is to be contrasted with the .6 percent of trees infected following Ribes eradication. This comparison is conservative in view of the fact that in the areas on which control work was done, 12.6 of the pines were infected prior to control work whereas in the check areas the infection started with only 2.8 percent of the trees infected at the time when Ribes eradication work was performed on the control areas.

Although these figures show that control work is effective, the results will be more striking in a few years. Since the rate of increase of the disease when uncontrolled is in geometric proportion rather than arithmetic, it is evident that within a few years the presence of the rust will result in the infection of 100 percent of the trees and an ever-increasing spread to new areas. In contrast, from the data tabulated following initial eradication, it is apparent that the application of control measures placing the areas on a maintenance basis will reduce the rate of spread and intensification of blister rust to the point where the continued growing of white pine in the Inland Empire is assured.

Informational Work

Informational work was continued with Blister Rust and Forest Service personnel, educational institutions, forest land owners and administrators and the general public.

Photographic work was increased in scope and furnished valuable service to the field forces in supplying aerial photographs of all control areas, large-scale maps for field use and for permanent records and ground pictures of all phases of all operations.